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AIR POLLUTION ABSTRACTS

47294-48617

June 1975

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 47294 - 48617.

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VOLUME 6, NO. 6 JUNE 1975

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

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Contract No. 68-02-1794, RFP No. Du-75-B158 .... *$24,200*
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Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110

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Geomet, Inc., 15 Firstfield Road, Gaithersburg, Maryland 20760

Contract No. 68-02-2049, RFP No. Du-75-C273 .... *$25,990*
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Hobbie Brothers Plumbing & Heating Company, 132 Hunt Street, Durham, North Carolina 27701

Contract No. 68-02-1438, Modification No. 2.......... *$192,300*
EXTENSION OF FRACTIONAL EFFICIENCY OF A UTILITY BOILER BAGHOUSE STUDY.
GCA Technology Division, GCA Corporation, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1795, RFP No. Du-75-B104 .... *$39,924*
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Syracuse University Research Corporation, Merrill Lane, University Heights, Syracuse, New York 13210

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AIR POLLUTION CONTROL ENGINEERING AND COST STUDY OF THE PETROCHEMICAL INDUSTRY.
Air Products & Chemicals, Inc., P. O. Box 427, Marcus Hook, Pennsylvania 19061

Contract No. 68-02-1883, RFP Du-75-A206 .... *$74,880*
FUNDAMENTAL STUDY OF SOLID SOLUTION FORMATION IN LIME AND LIMESTONE SO2 SCRUBBERS.
Radian Corporation, 8500 Shoal Creek Boulevard, Austin, Texas 78766

Contract No. 68-02-1383, Task Order No. 9 .... *$50,794*
AUTOMATED ESTIMATION OF NEDS DATA REQUIRED FOR ATMOSPHERIC MODELING.
Radian Corporation, 8500 Shoal Creek Boulevard, P. O. Box 9948, Austin, Texas

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University of Miami, Department of Biology, Coral Gables, Florida 33124

Contract No. 68-02-1882, RFP No. Du-75-A259 .... *$50,000*
DEVELOPMENT OF A COMPREHENSIVE SAMPLING AND ANALYSIS STRATEGY FOR REFINERY WASTE STREAMS.
Radian Corporation, 8500 Shoal Creek Boulevard, Austin, Texas 78766 (NOTE: Contract contains an estimated definization in the amount of $100,000)

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ANALYSIS OF PARTICULATE SAMPLES FOR STRONG ACID, SULFATE, AND AMMONIUM ION CONCENTRATION.
Rockwell International Corporation, P. O. Box 1085, Thousand Oaks, California 91360

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

47294 **APTIC NO. 69498**

Andren, A. W., Y. Talmi, D. H. Klein, and N. E. Bolton

PHYSICAL AND CHEMICAL CHARACTERIZATION OF SELENIUM IN COAL FIRED STEAM PLANT EMISSIONS. *Preprint, National Science Foundation, Washington, D. C., Research Applied to National Needs, 6p., 1974. 24 refs. (Presented at the Trace Contaminants Conference, Annual, 2nd, Oak Ridge, Tenn., Aug. 29-31, 1974.)*

Selenium was measured in coal, slag, and flue gas at the Allen Steam Plant in Memphis, Tennessee. Approximately 0.3% of the coal-derived selenium was incorporated into slag. Sixty-eight percent of the Se was found on the fly ash particles, the rest was found in the vapor phase. Since the electrostatic precipitators at the plant were very efficient for fly ash removal, 93% of the emitted Se existed in the vapor phase. The major part of the Se discharge from the steam plant occurred via fly ash removal to nearby slag ponds. All of the selenium in the slag and flue gas existed as elemental Se and was thus not immediately available for plant uptake. Selenium emission rates from data collected at the steam plant were used to calculate the minimum mobilization of Se from coal consumption in the U. S. and world. Calculations indicated that 1.5 to 2.5 times as much Se is mobilized by man through coal burning as by natural weathering. (Author abstract)

47295 **APTIC NO. 69593**

Ard, R. W., Jr. and R. A. Walter

THE COAST GUARD RESEARCH AND DEVELOPMENT PROGRAM FOR THE ABATEMENT OF VESSEL EXHAUST EMISSIONS. *Preprint, American Society of Mechanical Engineers, New York, 10p.. 1974. (Presented at the American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, Seattle, Wash., July 29-Aug. 1, 1974, Paper 74-ENAs-3.)*

The Coast Guard s research and development program for the abatement of stack emissions from the service s cutters is reviewed with particular emphasis on the work that has been completed. Past efforts in this field by other agencies have been noticeably lacking, and the Coast Guard has had to start this effort from the results of shore-based technology. An initial study was completed on November 30, 1971. It was a preliminary analysis of exhaust emissions from Coast Guard vessels and boats and showed the Coast Guard to be an insignificant contributor to air pollution on a national and regional basis. The next step was a sampling of the gaseous and particulate emissions from 14 cutters and boats in the First Coast Guard District (Boston, Mass.) under typical operation conditions. These measurements were performed on 57 diesel engines and boilers configured as main propulsion units, ship-service generators, and hotel-service boilers. Data was also obtained on particulate emission rates and smoke levels. Details of the study and examples of the data obtained are presented. Emission data is now being obtained on boat diesel and outboard engines. The manner of this study, interim results, and its ongoing direction are discussed. Highlights of the futre path of this program and the plans to modify and install control devices on Coast Guard engines are presented. (Author abstract)

47296 **APTIC NO. 70096**

Baalsrud, Kjell

ENVIRONMENTAL PROBLEMS AND THE PAPER INDUSTRY. *Norsk Skogind. (Norway), no. 12:374-376, 1974. (Presented at the World Pulp and Paper Conference, Stockholm, Sweden, Oct. 29, 1974.)*

Pollution from pulp and paper mills is reviewed. The five most important pollutants are sulfur dioxide and odor as air pollutants and suspended solids, organics as BOD, (biological oxygen demand) and lignin as color as water pollutants. Odors usually are caused by the emission of reduced sulfur compounds such as mercaptans during chemical pulping. Considerable amounts of dust and water vapor may also be emitted. In winter, the water vapor may condense and form sizeable clouds. Product prices for sulfite pulp, integrated sulfate pulp and paper, newsprint, and other paper and board plants are 173, 173, 165, and 230 $/ton, respectively. Pollution control costs as a percent of price are 1.8, 1.1, 2.0, and 0.5%, respectively for 1970, and 7.9, 5.8, 0.4, and 1.6% for 1975, respectively.

47297 **APTIC NO. 69238**

Boehlen, B.

OIL HEATERS AND AIR HYGIENE. *(Oelfeuerungen und Lufthygiene). Text in German. Preprint, Eidgenoessisches Amt fuer Umweltschutz, Bern (Switzerland), 15p., 1974. (Presented at the Pro Aqua-Pro Vita Conference, Basel, Switzerland, June 10-14, 1974.)*

According to a study conducted in Switzerland 50% of the air pollution comes from domestic heating, 18.5% from automobiles with gasoline engine, 5% from diesel-operated vehicles, and 19% from industry. These figures were obtained by assuming that the emissions are proportional the consumed quantities of fuels and gasolines, which is only valid if carbon dioxide and water are also taken into account. Using the quantity of actual pollutants as basis for the calculation it is found that the emissions from heaters amounted in 1970 to 150,000 tons, while those from automobiles reached 800,000 tons. Since the pollution of the atmosphere depends not only on the emitted quantity of pollutants but also on the emission height above ground, on the weather, and on topographical conditions, such figures cannot be used for an evaluation of the importance of individual sources. Domestic heating pollution can be reduced by a thrifty and efficient use of fuel oil and gasoline. Since 64.6% of all domestic heaters in Switzerland are fired by fuel oil, a reduction of the room temperature would be very effective. An increase of the efficacy of domestic heating systems would also help to reduce emissions. This will require an improvement of the present state-of-the-art of oil heaters. For reduction of the sulfur dioxide emissions, the desulfurization processes in refineries require improvement and increase of the desulfurization capacity.

47298 **APTIC NO. 70292**

Brocke, W.

EXPERIENCES WITH THE INSPECTIONS OF OIL-FIRED HEATERS IN THE FEDERAL REPUBLIC OF GERMANY. *(Erfahrungen ueber die Oelfeuerungskontrolle in Deutschland). Text in German. Luft Wasser, Pro*

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Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 62-70. 15 refs. (June.)

In the State of North Rhine Westphalia of the Federal Republic of Germany where oil-fired heaters have been subject to inspections ever since the winter of 1964/65, the complaints about a soot number in excess of 3 and of oil in the waste gas dropped steadily. After an initial rapid decline of the complaints about excessive soot emission they now approach asymptotically the value of about 10%. The fraction of inspected plants with oil derivatives in the waste gas fluctuated in 1966/67 between 2 and 3%. A carbon dioxide content between 10 to 13% by volume was found to be the optimum. If all oil-heaters were operated with a CO2 concentration of this magnitude the complaint rate concerning too much soot emission would go down to 8%, the specific soot emission would be cut by roughly one third, the complaints concerning oil derivatives in the waste gas would go down 80%, and the fuel consumption could be cut. Still further reductions could be achieved by optimization of the burner and boiler operation.

47299 **APTIC NO. 66674**

Candeli, A., V. Mastrandrea, G. Morozzi, and S. Toccaceli

CARCINOGENIC AIR POLLUTANTS IN THE EXHAUST FROM A EUROPEAN CAR OPERATING ON VARIOUS FUELS. *(Atmos. Environ., 8(7):693-705, July 1974. 36 refs.*

The influence of fuel variables on polycyclic aromatic hydrocarbons (PAH) emission was investigated. The fuel variables were tetra-ethyl lead (TEL) content (O and 0.63g/l), fuel aromaticity (0, 6, and 48%), and type of aromatic at constant total level of aromatics (benzene, xylene, and hydrocarbons with 9 and 10 carbon atoms). Each test consisted of European test cycles on a dynamometer bench, using a European engine of average displacement for European cars (1608 cu cm) and without deposits in the combustion chamber. It is not possible to generalize about the effect of TEL on PAH emission: in two cases the addition of TEL reduced and in one case it increased the PAH emission. Increasing fuel aromaticity increases PAH emission, but these results apply only to the three leaded tested fuels, and not to the same fuels unleaded. In three synthetic unleaded fuels at constant total aromatics the type of aromatic present strongly affected the PAH emissions. Simple aromatic hydrocarbons, such as benzene or xylene, produce less PAH than C9- and C10 hydrocarbons. (Author abstract modified)

47300 **APTIC NO. 69504**

Chu, Richard R.

NON-STACK GAS PARTICULATE EMISSIONS FROM CHEMICAL AND POWER PLANTS – A REVIEW. *Preprint, American Inst. of Chemical Engineers, 15p., 1974. 25 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Washington, D. C., Dec. 5, 1974, Paper 85e.)*

Major fugitive dust and nonstack particulate emission sources in power and chemical plants are described. The dispersion, distribution, and physico-chemical properties of these airborne particulate matters are also mentioned. Fugitive dust and particulate matter from the following sources were studied: cooling tower drift, coal storage, fly ash handling, construction and unpaved roads, and limestone processing. Their formation and control measures are described. Plant facility damages and environmental effects caused by airborne particles are also reviewed including atmospheric contamination of electric transmission insulators causing electric flashover, atmospheric corrosion, and environmental effects such as fogging and icing on roads. The major control methods for the sources are: advanced drift eliminators and high blowdown for cooling towers; water sprays, water/chemical sprays, asphalt coverings, tar coverings, clay coverings, and vacuum dust removal systems for coal storage and handling; paving, speed limits, watering by trucks for unpaved roads; watering by trucks or sprinkling systems, chemical soil stabilization, and planting of vegetation for construction; water sprays and filter and vacuum collecting systems for limestone handling; and water wetting and washing down the loading area for fly ash handling.

47301 **APTIC NO. 69976**

Cowherd, Chatten C., Jr., Christine M. Guenther, and Dennis D. Wallace

EMISSIONS INVENTORY OF AGRICULTURAL TILLING, UNPAVED ROADS AND AIRSTRIPS, AND CONSTRUCTION SITES (FINAL REPORT). *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1437, Rept. EPA-450/3-74-085, 49p., Nov. 1974. 21 refs.*

NTIS: PB 288919/AS

A national emission inventory was developed on a county-by-county basis to determine the air pollution impact of selected fugitive dust sources. Source categories included were unpaved roads, unpaved airstrips, heavy construction sites, and agricultural land tilling. Emission factors, which include correction factors to adjust for local climatic conditions and properties of emitting surfaces, were calculated for each county. Measures of the extent of activity for each category were derived from available data. The methodology including procedures used to estimate missing data is documented. The source data were coded on the National Emission Data System area source forms. (Author abstract modified)

47302 **APTIC NO. 69939**

Cowherd, Chatten, Jr., Kenneth Axetell, Jr., Christine M. Guenther, and George A. Jutze

DEVELOPMENT OF EMISSION FACTORS FOR FUGITIVE DUST SOURCES (FINAL REPORT). *Research Inst., Kansas City, Mo., Office of Air and Waste Management Contract 68-02-0619, Rept. EPA-450/3-74-037, 191p., June 1974. 30 refs.*

NTIS: PB 238262/AS

Field tests were conducted to develop emission factors for the following common sources of fugitive dust: unpaved roads, agricultural tilling, aggregate storage operations, and heavy construction activities. For each source type, emissions were related to meteorological and source parameters, including properties of the emitting surface and characteristics of the vehicle or implement which caused the emission. The information was used to derive correction factors which appropriately adjust basic emission factors to reflect regional differences in climate and surface properties. Calculated emission factors for unpaved roads ranged from 6.0 to 55.9 lb/vehicle-mi. Average dust emissions from unpaved roads had the following particle size characteristics: less than 2 micron, 25 wt%; 2-30 micron, 35 wt%; and 30-100 micron, 40 wt%. Emission factors for agricultural tilling ranged from 41.6-85.2 lbs/acre, with particle size characteristics of 35 wt% for particle diameters less than 2 micron, 45 wt% for 2-30 micron, and 20 wt% for particle diameters over 30 micron. Emission factors for aggregate storage emissions (total storage cycle) were: 0.04 lbs/ton for loading onto piles, 0.13 lbs/ton for vehicular traffic, 0.11 lbs/ton for wind erosion, and 0.05 lbs/ton for loadout from piles. Estimated emission values from two construction sites were 1.4 and 1.0 tons/acre/mo.

47303 **APTIC NO. 69480**

Crissey, Brian Laird

TRAPOL: A COLD-START SENSITIVE SIMULATION MODEL OF TRAFFIC- GENERATED AIR POLLUTION EMISSIONS. *Winter Simul. Conf., Annu. Proc., 1974, p. 186-194. 18 refs. (Jan. 14-16.)*

A meso-scaled traffic simulator, TRADYN (TRAffic DYNamics) is described which simulates rush-period urban traffic. The TRAPOL (TRAffic POLlution) model is an extension of TRADYN which models vehicle emissions as a function of traffic flow characteristics. It is sensitive to cold-start emissions resulting from passenger vehicles starting up from parking facilities in urban environments. Dynamic feedback is utilized to model traffic flow interactions at intersections and vehicles flow through the modeled network in fluid-like batches. The design of the model provides ease of operation and low cost. When coupled with a dispersion model yet to be designed, the TRAPOL simulation model should provide a useful tool for predicting the air quality impact of proposed traffic generators.

47304 **APTIC NO. 70097**

Csaba, J.

A METHOD FOR THE DETERMINATION OF ADIABATIC TEMPERATURE AND GAS COMPOSITION RESULTING FROM THE BURNING OF SULPHUR CONTAINING FUELS. *J. Inst. Fuel, 1974:262-267, Dec. 1974. 9 refs.*

A method is presented for calculating the equilibrium gas composition resulting from the burning of solid, liquid, or gaseous fuels with with air-fuel ratios and different air preheat temperatures. The method takes into account the effect of sulfur, carbon, hydrogen, and oxygen compounds on the adiabatic temperature and the composition of the resulting product. The following applications of the method are discussed as examples: the effect of air preheat on the adiabatic temperature obtained from the burning of a fuel with nearly stoichiometric air and on the sulfur trioxide/sulfur dioxiode ratio in the dissociated gas; the effect of the air-coal ratio on the adiabatic gas temperature and the SO3/SO2 ratio; and the effect of SO2 addition on a hydrogen-oxygen flame. The method of calculation and computer program using this method are more accurate tools for the designer of boilers than existing enthalpy-temperature charts, particularly for fuels containing sulfur and for combustion in unusual circumstances, for example with excess fuel. (Author abstract modified)

47305 **APTIC NO. 70039**

Decouflet, J.

PARAMETRIC STUDY OF CO, NOX, CHX EMISSIONS IN AIRCRAFT TURBOJETS. *(Etude parametrique des emissions CO, NOx, Chx des turboreacteurs d aviation). Society Nationale d Etude et de Construction de Moteurs d Aviation (France), Dept. Thermique, 681/YE/74-JD/CV, 5p., July 16, 1974. Translated from French, 6p.*

A parametric method for estimating the pollutants emitted from turbojets (carbon monoxide, uncombusted hydrocarbons, and nitrogen oxides) is discussed. The proposed study consists of: thermodynamic calculation of the turbojet operating at its nominal point as well as in various fixed point regimes on the ground; an estimate of the pollutants emitted from the combustion chamber as a function of the operating conditions (especially pressure and temperature) and of the engine size; and the preparation of tables showing the various gaseous pollutant outputs as a function of the internal parameters for a normal cycle. Points for which additional information appears necessary in the nominal cycle, operation outside the nominal, combustion chamber dimensions, and pollution characteristics are discussed.

47306 **APTIC NO. 69873**

Derndinger, Hans-Otto

AUTOMOBILE ENGINES. *(Kraftfahrzeugmotoren). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 116(18):1468-1472, Dec. 1974. 2 refs.*

A review is given of new engine developments for passenger cars and trucks. Changes in the size of the cylinders, the compaction ratio, the average pressure, and the specific capacity of engines for passenger cars are reviewed for the period from 1960 on. For truck engines, the exhaust gas and noise problems encountered in this period are discussed. The fuel consumption, smoke emission and carbon monoxide, hydrocarbon, and oxides of nitrogen concentrations of the exhaust gases received the greatest attention The fuel consumption is lowest with direct injection methods which belong to the most widely spread combustion methods. The problem of too much smoke for diesel engines can be solved by selection of a larger piston displacement or through charging. The biggest problem for diesel engines is the emission of oxides of nitrogen. A delay of the injection can decrease for formation of oxides of nitrogen to below the limit concentration presently valid in the USA.

47307 **APTIC NO. 69923**

Dow, Benjamin L., Jr.

AN INVESTIGATION OF STEEL MILL PARTICULATE USING SCANNING ELECTRON MICROSCOPY WITH ENERGY DISPERSIVE X-RAY ANALYSIS. *Purdue Univ., Lafayette, Ind., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-4957, 1974, 155p. 46 refs.*

Steel mill particulates were analyzed using scanning electron microscopy with energy dispersive X-ray analysis. Particles from an open hearth furnace, basic oxygen furnace, and electric furnace showed the same general composition regardless of size. Particulates from a sinter plant were not nearly as uniform. Particulates collected on 10 different days from the steel mill and analyzed by atomic absorption for cadmium, lead, and zinc showed cadmium/zinc ratios which indicated that a large portion of the cadmium present in steel scrap is present in an impurity in zinc and not as cadmium electroplated parts. This significantly reduces the amount of cadmium that may be released to the atmosphere in the recycling of scrap metal. The ratios of Zn/iron, calcium/Fe, Pb/Fe, manganese/Fe, and magnesium/Fe were used to characterize particles from four different steel mill processes, and a discriminant analysis procedure (linear analysis equations) was used to classify the particles. The classification results were satisfactory, with over 65% of the particles (0.1-10 micron) being classified correctly. High-volumed were used to investigate the contribution of steel mill particulate to the total particulate loading in the vicinity of the mill. When the wind was from the north, stations directly south of the mill showed increased iron levels. Correlations were found between iron, cadmium, lead, and zinc, indicating that these metals may have a common source. (Author abstract modified)

47308 **APTIC NO. 65503**

Dutton, Granville

FULFILLING PETROLEUM S ROLE. *Inst. of Environmental Sciences, Proc. Inst. Environ. Sci., Annu. Meet., 20th, Cost Eff. Environ. Sci. Washington, D. C., 1974, p. 274-279. (April 28-May 1.)*

The energy supply and demand, the energy crisis, petroleum s role as a fuel, and solutions to the energy crisis are discussed. The adequacy of U. S. energy resources is dependent upon political rather than technological developments. The current energy shortage is a direct result of governmental interference with the free market in energy dating back to the 1954 Supreme Court s decision directing Federal control of natural gas prices. Petroleum, which supplies over 75% of the nation s energy needs, faces a crisis before it can fulfill its role in alleviating the energy shortage. It would be worse to continue the panic measures of price controls, allocation, rationing, and excess-profits taxes which violate the law of supply and demand, than to allow the supply and demand factors to operate, letting fuel oil go to higher price levels. Artifically depressing prices prevents enterprising Americans from developing resources. To make the U. S. essentially self-sufficient with regard to oil, a critical balance must be achieved between economic, energy, and environmental conditions. The profits the oil industry is making in the energy crisis are not really excess profits, but will be used in the next 15 years to develop energy sources and to conduct research. The free market approach will result in the lowest prices and highest supply of energy sources possible. (Author abstract modified)

47309 **APTIC NO. 70239**

Ebeling, Fritz

THE BP RUHR REFINERY HAS BEEN EXPANDED. *(Erweiterung der BP-Ruhr-Raffinerie). Text in German. Erdoel Kohle - Erdgas - Petrochem., 27(12):784-788, 1974.*

The capacity of the BP-Ruhr-Refinery at Bucholtwelmen/Dinslaken has been increased from 5 million tons/annum to 11 million tons/ annum. Since the limit for the maximum allowable sulfur dioxide emissions was lowered, the use of certain fuels was ruled out. The SO2 emission reducing effect of the use of low-sulfur fuel is greater than had flue gas desulfurization equipment been installed. An SO2 monitoring system has been developed which gives alarm prior to reaching the maximum allowable emission limit. The efficiency of the existing sulfur plant was raised by the installation of a third reactor. Better control of the plant is achieved through an automatic analyzer which has been installed. For reduction of the hydrocarbon emissions, tanks with floating roofs and highly elastic tight sealing were installed.

47310 **APTIC NO. 65591**

First, Melvin W. and John J. Lynch

AIR POLLUTION CONTROL OF HIGH SPEED PRINTING PRESSES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-277.)*

Multicolor high-speed printing presses utilize direct flame and high temperature oven drying of the freshly applied inks. The ink solvent, a petroleum product having characteristics similar to diesel fuel, is volatilized and partially cracked in the flame. When discharged to the atmosphere, the products condense to form a persistent bluish-white haze which has a characteristic odor and eye-irritating properties. Field and laboratory studies have been conducted, utilizing infrared and gas chromatographic techniques, to define the nature of the aerosols and gases and to explore the effects of using alternate products. Stack gas treatment methods, including gas incineration, are covered. New ink systems which utilize plastics that cure rather than dry by solvent evaporation are explored. The application of Los Angeles County s Rule 66 to printing presses is reviewed and commented upon.

47311 **APTIC NO. 70142**

Flinn, James E. and Robert S. Reimers

TRACE ELEMENTS (METAL) CONTAMINANTS. *In: Development of Predictions of Future Pollution Problems. Washington Environmental Research Center, Washington, D. C., Implementation Research Div., Environmental Protection Agency Contract 69-01-1837, Program Element 1HA095, Rept. EPA-600/5-74-005, p. 32-44, March 1974. 23 refs.*

GPO

The problem of trace element contaminants is reviewed. Major sources include natural sources such as water and industrial sources such as lead-zinc processing and lead smelters and refineries, primary and secondary metals processing, production of inorganics, chemical manufacture, and industrial sludges and solid residues (tailings). Other major sources of trace contaminants include automotive exhaust, leaching from municipal landfills, and incineration and land disposal of sewage sludge. Some known effects for lead, mercury, cadmium, and manganese are reviewed. Trace elements may cause acute effects such as those that occurred in Japan with regard to mercury (Minamata disaster) or chronic effects due to low-level exposures over long periods. Control of trace elements will require increased knowledge of health effects, establishment of safe levels, development of control and monitoring technology to achieve these standards, and setting of air and water quality standards for the various elements.

47312 **APTIC NO. 70145**

Flinn, James R. and Robert S. Reimers

FINE PARTICULATES. *In: Development of Predictions of Future Pollution Problems. Washington Environmental Research Center, Washington, D. C., Implementation Research Div., Environmental Protection Agency Contract 68-01-1837, Program Element 1HA095, Rept. EPA-600/5-74-005, p. 94-106, March 1974. 7 refs.*

GPO

The problem of fine particulates is reviewed. Fine particulate matter is defined as material that exists as solid or liquid in the size range of 0.01 to 2 micron in diameter. The environmental effects of fine particulates are discussed, including effects on health, visibility, climate near the ground, vegetation, materials, public concern, odors, and economics. Sources of the hazardous pollutants mercury, beryllium, asbestos, lead, cadmium, and polycyclic organic matter are listed, and sources of fine particulate emissions for the years 1975 and 1980 are projected.

47313 **APTIC NO. 69944**

Gerstle, R. W.

ATMOSPHERIC EMISSIONS FROM ASPHALT ROOFING PROCESSES (FINAL REPORT). *PEDCo-Environmental, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-03-1321, Task 15 and 68-02-0237, Task 30, ROAP 21AXM-011, Program Element 1AB015, Rept. EPA-650/2-74-101, 159p., Oct. 1974. 36 refs.*

NTIS: PB 238 445/AS

Asphalt roofing manufacturing processes and the types of air pollution control devices applied to them are described. Quantitative data on controlled and uncontrolled particulate and gaseous emissions, including polycyclic compounds, from the asphalt blowing and felt saturating processes are provided. Information on plant locations, economic factors, control costs, raw materials, production rates, and industry growth is included. Total uncontrolled particulate emissions from felt saturating, consisting largely of organic particulate compounds, averaged from 3.9 to 8.7 lbs/ton of saturated felt; carbon monoxide and gaseous hydrocarbons were also emitted. Control devices reduced these emissions by about 50%. Saturator emissions were controlled by electrostatic precipitators, scrubbers, afterburners, and mesh filters. Seven identified polycyclic organic compounds accounted for 0.0003% of the particulate matter both before and after control. Particulate matter was mostly smaller than 1 micron. For asphalt blowing operations controlled by fume incineration, particulate emissions amounted to 0.3-3.1 lbs/1000 gal (0.075-0.79 lbs/ton) of asphalt; polycyclic organic matter ranged between 0.0008 and 0.0019% of the total particulate; carbon monoxide and gaseous hydrocarbons were also emitted. A well-operated plant equipped with control devices thus does not have a major impact on ambient air concentrations. (Author abstract modified)

47314 **APTIC NO. 67126**

Gottesman, Roy T.

CHEMISTRY AND TECHNOLOGY OF POLYVINYL CHLORIDE. *American Chemical Society, Washington, D. C., Div. of Organic Coatings and Plastics Chemistry, 47p., 1974. 30 refs. (Presented at the American Chemical Society, Division of Organic Coating Plastics Chemistry, 50th Anniversary Symposium, Atlantic City, N. J., Sept. 11, 1974.)*

A review is presented on the chemistry and technology of polyvinyl chloride (PVC) as well as copolymers of vinyl chloride with smaller amounts of other ethylene unsaturated monomers. Topics covered include: the history of the production of polyvinyl chloride, the manufacture of vinyl chloride monomer, polymerization of vinyl chloride, the physical and chemical characterization of polyvinyl chloride, classification of PVC resins, processing aids, impact modifiers, other additives, applications of PVC, and vinyl chloride toxicity in relation to occupational safety and health standards. Angiosarcomas in occupationally-exposed people working with the vinyl chloride monomer and vinyl chloride-induced liver angiosarcomas in experimental animals are discussed in relation to revised occupational safety and health standards for the suspected carcinogenic vinyl monomer.

47315 **APTIC NO. 69679**

Hare, Charles T., Karl J. Springer, and Thomas A. Huls

SNOWMOBILE ENGINE EMISSIONS AND THEIR IMPACT. *Preprint, Society of Automotive Engineers, Inc., New York, 30p., 1974. 28 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740735.)*

Emissions from four snowmobile engines (one rotary and three two-stroke twins) were measured under a variety of operating conditions. These data were used in conjunction with the best available information on snowmobile population, annual usage, and duty cycles to estimate emission factors and national emissions impact. Expressing estimated snowmobile engine emissions are percetanges of revised 1970 national totals from all sources, snowmobiles appear to account for approximately 0.2% of hydrocarbons, 0.1% of carbon monoxide, 0.004% of nitrogen oxides, 0.0008% of particulate, and 0.0003% of sulfur oxides. As percentages of revised 1970 mobile source emissions, snowmobiles are estimated to account for about 0.4% of hydrocarbons, 0.1% of CO, 0.009% of NOx, 0.3% of particulate, and 0.009% of SOx. All these figures are minimal on a national basis. About 93% of the emissions occur in the northern region and 7% in the central region. About 63% of snowmobile emissions occur in the Dec.-Feb. quarter, and about 19% each in the late fall and early spring. Drastic changes in snowmobile emissions are not expected to occur on a national basis due to any foreseeable factor. (Author summary modified)

47316 **APTIC NO. 69886**

Hare, Charles T. and Karl J. Springer

EXHAUST EMISSIONS FROM UNCONTROLLED VEHICLES AND RELATED EQUIPMENT USING INTERNAL COMBUSTION ENGINES: PART 7 - SNOWMOBILES (FINAL REPORT). *Southwest Research Inst., San Antonio, Tex., Office of Air and Waste Managemen Contract EHS 70-108, Rept. AR-946, Rept. APTD-1496, 89p., April 1974. 27 refs.*

NTIS: PB 238295/AS

Exhaust emissions from snowmobile engines (three two-stroke twins and one rotary) were measured during steady-state mapping procedures which included idle conditions and 28 other speed/load combinations. Emission factors and national emissions impact were also estimated. As percentages of revised 1970 national totals from all sources, snowmobiles account for approximately 0.2% hydrocarbons, 0.1% carbon monoxide, 0.004% nitrogen oxides, 0.008% particulates, and 0.0003% sulfur oxides. As percentages of revised 1970 mobile source emissions, snowmobiles account for about 0.4% hydrocarbons, 0.1% CO, 0.009% NOx, 0.3% particulates, and 0.009% SOx. These figures are minimal on a national basis. An estimate of seasonal and regional variation in snowmobile emissions shows that about 93% of such emissions occur in the northern region and 7% in the central region of the country. About 63% occur in the December to February quarter, 19% in the late fall, and 19% in the early spring. (Author summary modified)

47317 **APTIC NO. 66763**

Hausgaard, Olaf

CONSUMPTION OF ENERGY IN NEW YORK STATE: 1972. (WITH ESTIMATES FOR 1973). *State of New York Public Service Commission, Office of Economic Research, Rept. 19, 31p., Jan. 1974. 2 refs.*

NTIS N74-20614

Energy consumption data for New York State are tabulated for the year 1972 and include revisions in the 1971 consumption data previously reported as well as estimates for 1973 consumption. Revisions in the 1971 consumption data for fossil fuels are reported by the Bureau of Mines as reported by the Bureau of Mines, based on new tabulations, reveal that the energy consumption in New York State during 1971 was 53.6 T-BTU below 1970 figures. The industrial sector in 1972 consumed 414.8 T-BTU from fossil fuels, a decline of 8.9% from the 1971 level. During both 1971 and 1972 the other major energy consuming sectors continued upward trends in energy consumption, and the growth of these other sectors during 1972 was large enough to overcome the declines in the industrial sector so that overall energy consumption in the state increased by 61.5 T-BTU to 4,280.8 T-BTU. The consumption of natural gas in 1972 was 689 billion cu ft, a decline of 3.8% from 1971. Coal consumption continued a steady decline begun in 1967, and is estimated to continue declining in 1973. A leveling off of the coal consumption decline or even an increase in consumption is projected for 1974. The consumption of all refined petroleum products in the state continued to increase through the end of 1972 and is estimated to increase in 1973 as well.

47318 **APTIC NO. 69240**

Hess, W.

RESULTS OF AIR QUALITY EXAMINATIONS IN THE CITY OF ZURICH. *(Ergebnisse von Luftuntersuchungen in der Stadt Zuerich). Text in German. Preprint, 5p., 1974. 14 refs. (Presented at the Pro Aqua - Pro Vita Conference, Basel, Switzerland, June 10-14, 1974.)*

Due to the topographic conditions in Zurich and the dense development, air pollution by waste gases from domestic heating is considerable. The pollution stems from purely serviced oil heating systems plus pollutants such as sulfur dioxide liberated at the combustion of mineral oil products and other fuels. In the winter of 1971/72, 30% of the heating systems emitted oil- containing waste gases and odors. Thanks to the intensive control activity and good cooperation with the service and maintenance people of manufacturers of oil heating systems this percentage could be reduced by 10% the following winter. Studies of the pollution of Zurich by automobiles revealed that the exhaust gas pollution by automobiles in a street 10 m from the street curb was only 40% of the values at the street curb provided the wind blows perpendicularly to the street direction. Based on studies of the exhaust gas pollution by automobiles, pollution forecasts can be provided for areas through which new streets are being built. Apart from such pollutants as carbon monoxide, oxides of nitrogen, and hydrocarbons, the concentration of airborne dust was determined. In addition meteorological measurements such as the vertical temperature distribution and wind conditions were determined with a balloon on November 22, 1973. The result showed a typical nice weather inversion with weak winds. The inversion lasted until late afternoon because of the winterly weak solar radiation.

47319 **APTIC NO. 67526**

Hinds, G. P., Jr. and W. A. Bailey, Jr.

THE INFLUENCE OF FUEL COMPOSITION ON TOTAL ENERGY RESOURCES. *Preprint, American Chemical Society, 23p., 1974. 14 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 1, 1974.)*

The influence of fuel composition on total energy resources is examined in terms of thermal efficiency obtained from different processing routes. The usable hydrogen content of the raw material from which a fuel is to be made has a significant effect on the energy required to produce it, and when starting material contains sufficient hydrogen so that auxiliary generation is not needed, the efficiency of energy resource use can be high. Since fluid fuels will probably be desirable for self-propelled vehicles for a considerable time, and since these fuels will have to be synthesized from raw materials low in hydrogen (e.g., shale oil, coal, or coke), engines should be designed which can operate efficiently on highly aromatic hydrocarbon mixtures, preferably of low volatility. Although the manufacture of a highly aromatic liquid fuel from a hydrogen-rich paraffinic crude oil requires so much additional processing that the energy recovery is undoubtedly lower than if more conventional products are made, aromatic fuel manufacture may represent one way to conserve natural resources since future raw materials will probably be low in usable hydrogen.

47320 **APTIC NO. 69280**

Hishida, Kazuo

THE METHODS AND CALCULATION OF THE TOTAL EMISSION QUANTITY REGULATION. *(Soryo kisei no shuho to santei). Text in Japanese. PPM (Japan) 5(9):44-66, Sept. 1974.*

The topics of discussion include: the need for establishment of the environmental capacity, the process of basic investigation and analysis for environmental capacity, the maintenance of fixed emission source data and the calculation of emission intensity, the determination of emission intensity for dispersion models, the maintenance of pollutant condensation data and meteorological data, the statistical analysis required for the preparation of dispersion model, calculation of the environmental capacity by statistical analysis, preparation of dispersion models, the calculation of pollutant concentration indexes by the dispersion model, the establishment of environmental goals. These discussions include mathematical analysis of pollutant sources and the prediction of future emission quantities, an examination of the emission factors of mobile sources, box models, effective stack heights, and maps of the Tokyo area pollutant concentration intensities. The pollution contribution rates of sulfur dioxide in Tokyo from mobile source is 7.4%, the intensity rate, 5%, and the emission intensity is 142 N cu m/hr; the ground surface sources contribution is 48.7%, the intensity 997 N cu m/hr and 35.1%; the upper surface sources contribution is 32%, the intensity 694 N cu m/hr and 24.4%; from point sources, the contribution is 11.9%, the intensity, 1009 N cu m/hr, and 35.5%. The calculation and actual measurement were in good agreement, correlation 0.81. For nitrogen oxides, no correlation was obtained. The contribution from cars was calculated to be 84.1%. The calculation and actual measurement of carbon monoxide agreed well. The contribution of mobile sources was calculated to be 96.6%.

47321 **APTIC NO. 69815**

Holdeman, James D.

GASEOUS EXHAUST EMISSIONS FROM A J-58 ENGINE AT SIMULATED SUPERSONIC FLIGHT CONDITIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-71532, 25p., April 1974. 7 refs.*

NTIS: N74-23340

Emissions of total oxides of nitrogen, unburned hydrocarbons, carbon monoxide, and carbon dioxide from a J-58 engine at simulated flight conditions of Mach 2.0,2.4, and 2.8 at 19.8 km altitude are reported. For each flight condition, measurements were made for four engine power levels from maximum power without afterburning through maximum afterburning. These measurements were made 7 cm downstream of the engine primary nozzle using a single point traversing gas sample probe. Emissions varied with flight speed, engine power level, and with radial position across the exhaust. In afterburning modes there were significant gradients in exhaust temperature, local fuel/air ratio, and species concentrations across the exhaust plane. Traverse increments on the order of 0.1 of the exhaust radius were required to document these gradients. Oxides of nitrogen emissions increased by slightly more than a factor of two from Mach 2 to 2.8. The NOx emission index values for military power at Mach 2.0, 2.4, and 2.8 indicated that the increase was nearly linear with increasing Mach number in this range. For each flight condition, the NOx emission indices in afterburning modes were on the order of 1/2 of the value at military power for the same flight speed. At military power, unburned HC emission indicies were less than 0.2 for all flight speeds. In afterburning modes, HC emission were substantially higher than military power due to high HC concentrations in the center region of the exhaust. The peak concentrations and radial extent of this region decreased with increasing flight speed and increasing power level. The CO emission index at military power for Mach 2.0 was approximately 3 g CO/kg fuel and decreased with increasing flight speed. In afterburning modes, CO emissions were substantially higher than at militaty power for all flight speeds. The CO levls and the regions of the exhaust in which these emissions were highest were dependent on afterburning power level. (Author abstract modified)

47322 **APTIC NO. 69544**

Jutze, George and Kenneth Axetell

INVESTIGATION OF FUGITIVE DUST. VOLUME I - SOURCES, EMISSIONS, AND CONTROL (FINAL REPORT). *PEDCo Environmental Specialists, Inc., Cincinnati, Ohio, Office of Air and Waste Management Contract 68-02-0044, Task 9, Program Element 412953BDD1, Rept. EPA-450/3-74-036-a, 152p., June 1974. 61 refs.*

Studies were undertaken to identify major sources of fugitive dust, quantify their respective contributions to emission inventories of six Air Quality Control Regions, and to estimate means for their control. Emission factors utilized were based on a variety of information, ranging from factors reported in the literature to values developed from empirical data generated by the study. Fugitive dust emissions were much greater than particulate emissions from conventional point and area sources in each of the six Air Qualtiy Regions, though the relative importance of individual fugitive dust source categories varied considerably from one region to another. Agricultural emissions overshadowed all other sources in two of the regions and were a large contributor in a third. Unpaved roads were the largest source of particulates in the other four regions. Fugitive dust from construction was prominent in three regions with large metropolitan areas. Most of the fugitive dust controls employed were applications of one of three basic techniques: watering, chemical, surface treatment, or reduction of surface wind speed across exposed sources. Least attention from an air pollution control standpoint was given to fugitive dust emissions from agriculture which is the most difficult source to control with existing technology.

47323 **APTIC NO. 65181**

Kaakinen, Jown W., Roger M. Jorden, and Ronald E. West

TRACE ELEMENT STUDY IN A PULVERIZED-COAL-FIRED POWER PLANT. *Preprint, Air Pollution Control Assoc., 22p., 1974. 24 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-8.)*

Trace element concentrations and total mass flow rates of solid and liquid materials in all inlet and outlet streams of a pulverized-coal-fired power plant were measured to study the fate of trace elements from coal combustion. Concentrations of 17 elements were determined by atomic abosrption spectrophotometry, X-ray fluorescence spectroscopy, and wet chemistry. Overall mass balances for nine elements gave closures within 10%. Aluminum, iron, rubidium, strontium, yttrium, and niobium were at essentially constant concentrations in all outlet ash streams. Copper, zinc, arsenic, molybdenum, antimony, lead, and the radioisotopes lead-210 and polonium-210 were in their lowest concentrations in the bottom ash and in progressively higher concentrations in fly ash collected successively downstream toward the stack. The bulk of the coal inputs of elements in both of these groups were retained in ashes at the power plant. Poor mass balance closures for mercury and selenium based only on solid and liquid samples suggested that portions of these two elements existed as vapors and/or very fine aerosols in flue gas which passed through the particulate control devices. The successive enrichment in the downstream direction of certain trace elements in fly ash was probably due to volatilization of these elements or their compounds in the furnace, their subsequent condensation or adsorption onto suspended fly ash particles, resulting in their relatively higher concentrations in the finer particles, and the relatively greater penetration of these finer particles through the particulate control devices. (Author abstract)

47324 **APTIC NO. 70291**

Keller, Albert

HOW DO MANUFACTURERS OF OIL-FIRED HEATERS VIEW THE PROBLEMS OF AIR POLLUTION? *(Wie sieht die Oelfeuerungsbranche die Lufthygieneprobleme). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 54-61. (June.)*

The introduction of the first official flue gas inspections in Zurich ten years ago was viewed skeptically by the manufacturers of burners and boilers. This attitude was mainly due to the shortage of personnel and the added workload of additional measurements that became necessary mainly during the winter months. The beginning of the inspections also coincided with difficulties in the oil-heating sector. With regard to air hygiene it led to products which frequently produced no satisfactory combustion. This attitude began to change when the inspections revealed that instead of competition, a cooperation by burner and boiler manufacturers was needed to arrive at the desired goal of producing a boiler/burner unit that fulfills demands concerning combustion and air hygiene. Individual developments of boilers and burners in the past decade are described and evaluated with regard to the emissions produced.

47325 **APTIC NO. 69244**

Kopac, Petr and Edward Hazuka

OPERATIONAL PREDICTION OF THE SO2 AND FLY-ASH EMISSIONS IN THE FRAMEWORK OF LONG-TERM ENERGETICS PLANNING. *(Metoda operativni predikce emisi SO2 a popilku v ramci dlouhodoleho rozvoje energetickeho hospodarstvi). Text in Czech. Energetika, 24(7):288-290, 1974. 2 refs.*

Two algorithms were developed for use in predicting the total sulfur dioxide and fly ash emissions, at 5-year intervals from 1970 to 1990. They take into account the use of 24 different fuels, their sulfur (or ash) content, the S fraction empirically converted into SO2, 12 different types of energy conversion processes, and the 10 regions of Czechoslovakia. The setting up of the programs may be tedious but the actual computation should be fast and easy. The breadth and the completeness of the information on which the computation is based should produce a detailed picture of the effects of all the important variables on the SO2 and fly ash emissions. Further work is planned to obtain more information on the sulfur content of each type of fuel and on the ratio of the total sulfur to the sulfur, emitted by each fuel in each of the conversion processes.

47326 **APTIC NO. 69396**

Kraus, B. J. and J. F. Coburn

EMISSIONS FROM DOMESTIC HEATING OIL COMBUSTION. *Preprint, American Chemical Society, Washington, D. C., 12p., 1974. (Presented at the American Chemical Society, Annual Meeting, Atlantic City, N. J., Sept. 13, 1974.)*

Domesting heating oil combustion is not covered by Federal emission regulations. Since a sizable fraction of all petroleum is consumed in residential use, particularly in the winter, this potential source of air pollutants was studied. The effect of fuel composition on emissions of smoke, particulates, carbon monoxide, hydrocarbons, nitrogen oxides, and polynuclear aromatic hydrocarbons was studied in a typical hot air furnace (rated at 119,000 Btu/hr heat input). The fuels studied were No. 2 fuel oil, kerosene, low API gravity fuel, and high FBP fuel. An increase in final boiling point of the fuel led to higher smoke. Normal burner service would assure smoke-free combustion of a wide range of fuels. In the practical operating range, there was no significant effect of fuel composition on mass particulate, CO, total HC, and NOx emissions. Though the fuel polynuclear aromatic hydrocarbon content influenced the number of polynuclear aromatic hydrocarbons emitted, survival of the fuel polynuclear aromatics through the combustion process is negligible.

47327 **APTIC NO. 69310**

Kretschmar, Raymund

AMMONIA AND HYDROGEN SULFIDE DEVELOPMENT AT DEVELOPMENT AT THE DECOMPOSITION OF PIG MANURE THROUGH AERATION. *(Ammoniak-und Schwefelwasserstoffentwicklung beim Abbau von Schweineguelle durch Umwaelzbelueftung). Text in German. Wasser Luft Betrieb, 18(9):498-503, 1974. 8 refs.*

The liquid pig manure disposal by Lauer in three steps in the aeration silo led to hygienically desirable self-heating but also to odor emissions by ammonia and hydrogen sulfide. The conditions leading to the odor emissions were studied in laboratory experiments. Aerobic conditions with temperature increases of 10 C every 48 hr and a duration of the experiment of 288 hr yielded with increasing temperature from 60 C on a more than proportionally rising NH3 emission. The hydrogen sulfide development was reciprocal to the temperature increase. Fresh manure exposed under aerobic conditions to a temperature of 20 C for 48 hr and from 20 C on increased by 10 C every 48 hours to a temperature of 70 C also produced overproportional increases of NH3 emission. The emission of H2S did not react clearly to the temperature conditions. Anaerobic decomposition brought no increases of the NH3 emission with rising temperature during 288 hours. The H2S emission rose with the temperature increase. Fresh manure exposed to temperatures from 20 C on developed nearly no NH3. Organic acids were present only from 60 to 70 C on. Up to 60 C the H2S emission was low. It rose only from 70 C on to unexpected proportions. Aerobic pig manure decomposition thus produces more odors while anaerobic decomposition does not produce high enough temperatures to kill all pathogenic germs.

47328 **APTIC NO. 69246**

Kuhlmann, Albert, Eberhard Plassmann, and Heinrich Waldeyer

EXHAUST GAS EMISSIONS BY TRAFFIC. DETERMINATION, EVALUATION AND PROCESSING FOR THE EMISSION INVENTORY - RESULTS. *(Abgasemissionen des Verkehrs. Ermittlung, Beurteilung und Aufbereitung fuer das Emissionskataster - Ergebnisse). Text in German. Preprint, 16p., 1974. (Presented at the Pro Aqua-Pro Vita Conference, Basel, Switzerland, June 10-14, 1974.)*

After a general description of the collection and processing of information for the emission inventory established in Cologne, the procedure for the collection and processing of data concerning emissions by automobile exhausts is discussed in detail. The sum of the emissions of all vehicles in the investigation area has been entered rather than the individual automotive emission grouped into passenger traffic and truck traffic. The following exhaust gas components were measured for the emission inventory: carbon monoxide, the sum of unburned hydrocarbons, oxides of nitrogen, sulfur dioxide, lead compounds, and soot. The emissions of automobiles are influenced by a number of factors which include automobile-specific factors such as type of mixture preparation and shape of combustion chamber and traffic-specific factors, such as traffic density and average speed. For determination of the automobile-specific factors, a representative selection of cars underwent examinations on the test stand. With regard to the traffic-specific factors, the consideration of the traffic situation depending on the time of the day and a differentiation in weekdays. Saturdays, and Sundays was sufficient. The results re illustrated in graphs. They supply information on the on the total automobile emissions in the area as well as on the emissions in individual streets. About 90% of the emitted pollution was carbon monoxide. In a board and well ventilated street of Colgne, the half hourly emission concentrations reached ak values of 25 ppm.

47329 APTIC NO. 66066

Maczynski, Boguslaw and Barbara Falkiewicz

EFFECT OF VARIOUS IONIZING FACTORS ON THE CONCENTRATION OF CONDENSATION NUCLEI IN THE AIR OF AN OFFICE ROOM. *Environ. Res., 7(3):303-310, June 1974. 12 refs.*

In an office room, the concentrations of condensation nuclei (CN) were measured previous to and during the action of: a quartz lamp, an electric heater, an EDA-NW5 mechanical air moistener, and a source of compressed carbon dioxide raising the CO2 content of the air to 2%. These factors caused the following changes in CN concentrations: the ultraviolet lamp, 30% increase; the heater, 148% increase; the CO2 source, 42% increase; and the humidifier, a 32% decrease. The above variations were statistically significant. Their dependence on simultaneous air ionization, their relation to the dust content of the air, and their biometeorological importance are discussed. (Author abstract)

47330 APTIC NO. 70122

Masaki, Hiroshi

THERMAL POWER GENERATION AND ENVIRONMENTAL DISRUPTION. *(Karyoku hatsuden to kankyo hakai). Text in Japanese. Shizen Hogo (Conserv. Nature), no. 144:9-10, May 1974.*

Public hazards caused by thermal power stations are undeniable. The policy of high economic growth by establishing thermal power stations causes public hazards throughout the entire country and the disruption of the environment. The Hokkaido Electric Power Co., Inc. planned construction of a thermal power station in Date City in 1969. The construction was pushed steadily with the cooperation of governments without paying attention to the opinions of the inhabitants. Meanwhile, the general director of the Japan Environment Agency, stated that the Hokkaido Electric Power Co. should deepen its understanding of the opinions of the inhabitants. On the following day, the Hokkaido Electric Power Co., Inc. started on the construction work. Fishermen in the region deplored the waters contaminated by the construction work. Farmers complained about shortages of well water as a result of the falling water level. Three years ago a petition was sent to the Ministry of International Trade and Industry to the effect that if a thermal power station were constructed, public hazards will result. The Hokkaido Electric Power Co., Inc. was sued in an effort to suspend the construction work for the Date Thermal Power Station. The Sapporo District Court, however, rejected the suit.

47331 APTIC NO. 69671

Milkins, E. E., H. C. Watson, L. C. Goldsworthy, and R. J. Hallworth

CYCLE BY CYCLE VARIABILITY IN EMISSIONS OF A SPARK IGNITION ENGINE. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 8p., 1974. 14 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Toronto, Ontario, Oct. 21-25, 1974, Paper 741034.)*

The exhaust emissions from a single-cylinder spark ignition engine were measured as a function of burning time. Flame propagation time was measured with an ionization probe, and the exhaust gas was sampled with a gas sampling valve. Electronic control logic determined the cycles to be sampled, based on the flame propagation time. Tests were carried out at full throttle, for lean, optimum, and rich air/fuel ratios. The exhaust components measured were carbon monoxide, hydrocarbons, oxygen, hydrogen, and nitrogen using a gas chromatograph. The emission most affected by cycle-by-cycle variability (CBCV) was CO. Cycles that were either faster or slower than the mean cycle increased CO, particularly at lean air/fuel ratios where a five-fold difference in CO concentration was measured. Hydrocarbon emissions showed a 150% change for the same conditions. For other than lean air/fuel operation, hydrogen was an exhaust product, up to 6% at rich air/fuel operation. It is well established that reductions in CBCV would improve efficiency and power output. It was established here that a reduction in CBCV would also reduce overall CO and HC emissions, particularly for very lean operation. (Author abstract)

47332 APTIC NO. 66656

Mogan, J. P., D. B. Stewart, and E. D. Dainty

ANALYZING LHD EXHAUSTS. *Can. Mining J., 95(9):35-36, 60, Sept. 1974. 7 refs.*

Exhaust emissions were measured in a Deutz V-6 diesel engine equipped with catalytic purifiers, in a configuration similiar to that found in a typical LHD vehicle. The nitric oxide increased to a peak of about 580 ppm. Peaks were produced at a fuel to air ratio of about 0.025, or slightly in excess of half load. Nitrogen dioxide was detected in the exhaust gas engine only at idle and light load. The highest concentration of carbon monoxide recorded was about 520 ppm. Maximum levels of unconverted CO in the exhaust could reach 175 g/hr at 2200 rpm and light load. No significant amount of non-combustible particulate material was detected in the exhaust stream before the purifier; that found after the purifier increased with increasing speed up to a level of 14 g/hr. Levels of combustible particulates were about 50% higher than those found in a direct injection engine at comparable fuel to air ratios.

47333 APTIC NO. 70241

Murayama, Tadashi, Noboru Miyamoto, Shizuo Sasaki, and Dai Takahashi

AN ESTIMATE OF DIESEL ENGINE NO EMISSION QUANTITY BY A SIMPLE MATH MODEL. *(Kantan na masu moderu ni yoru dizeru kikan no NO seisei ryo no suitei). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 315-326, 1974. 8 refs. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

For the estimation of nitric oxide concentrations emitted from diesel engines, a series of simple models were developed. The validity of models was evaluated by comparing the calculated values and experimental values. Based on the two-molecule reaction, simple math models were developed, and the formation quantity of NO was estimated from the indicator chart. In all models, when the combustion element was considered to be adiabatic, the calculated value of NO concentration was extremely high, particularly at high load region. Therefore, it is obvious that the heat flow from combustion element has to be considered. The calculated values based on math models were in fairly good agreement with experimental values in the case of precombustion chamber engines, however, the discrepancy between the experimental value and calculated value increased in the case of direct injection engines with higher ununiformity of combustion.

47334 APTIC NO. 69466

Naugle, D. F.

POLLUTION EMISSION ANALYSIS OF SELECTED AIR FORCE AIRCRAFT. *Preprint, American Society of Mechanical Engineers, New York, 12p., 1974. 9 refs. (Presented at the American Society of Mechanical Engineers Intersociety Conference on Environmental Systems, Seattle, Wash., July 29-Aug. 1, 1974, Paper 74-ENAs-30.)*

Emission factors representing the emissions from about 43% of all engine models currently in use by the Air Force and accounting for about 82% of the total engine usage are presented along with a comparison of cycle times for military transport and jet categories. Pollutant emission rates for particulates, nitrogen oxides, carbon monoxide, and unburned hydrocarbons, respectively, are: 0.5-49.0, 1.02-13.79, 0.6-1155.8, and 0.07-191.4 lbs/100 lb of fuel, depending on mode of operation. Cycle times for six aircraft studied are significantly longer than the standard Environmental Protection Agency cycle times, and substantial error in impact assessments is therefore possible unless specific military aircraft operating procedures are considered. Aircraft of the B-52 type exhibit significantly higher emissions per landing-and-takeoff cycle than commercial 707 and 727 aircraft, though annual emissions from the B-52 are low due to low activity levels. Highest annual emissions are produced from small but highly active training aircraft using touch-and-go operations.

47335 **APTIC NO. 65222**

Overcamp, Thomas J. and Gerhard W. Israel

SALT DEPOSITION FROM COOLING TOWERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1974. 21 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-75.)*

A model to calculate salt deposition from natural draft cooling towers that use brackish or sea water is presented. It incorporates a method for estimating the effective height of emission of the drift droplets and the combined effects of sedimentation, evaporation, and dispersion of the droplets due to atmospheric turbulence. The effects of turbulence must be incorporated in order to calculate correctly the deposition around the tower except in the case of a very stable atmosphere. Sample calculations are presented to show the effects of the initial size of the droplets and the mean wind. (Author abstract)

47336 **APTIC NO. 70188**

Patterson, R. M., R. M. Bradway, G. A. Gordon, R. G. Orner, R. W. Cass, and F. A. Record

VALIDATION STUDY OF AN APPROACH FOR EVALUATING THE IMPACT OF A SHOPPING CENTER ON AMBIENT CARBON MONOXIDE CONCENTRATIONS (FINAL REPORT). *GCA Corp., Bedford, Mass., Technology Div., Office of Air and Waste Management Contract 68-02-1376, Proj. T.O. 2, Program Element 512953DDD1 68X0108, Rept. EPA-450/3-74-059, GCA-TR-74-4-G, 152p., Aug. 1974. 8 refs.*

NTIS: PB 238 480/AS

A joint traffic and carbon monoxide study was conducted at a regional shopping center. The application of the results towards the validation of a proposed approach to assess the air quality impact of shopping centers is described. Automatic traffic recorders were installed at all entrance and exit gates, and five CO monitors were set up at likely upwind-downwind locations and at the main gate. Running time studies were made using pursuit vehicles. Wind speed and direction measurements were taken. The proposed methodology underestimated the pre- Christmas peak-hour traffic volumes and overestimated the running times. However, the average emission density computed by the methodology was essentially equivalent to that calculated using data collected at the site. Peak-hour calculated concentrations correlated favorably with those observed, but they averaged a factor or two higher than those observed. There was a tendency for the calculated values to be overestimates for low wind speeds and underestimates at moderate wind speeds. The peak 8-hour calculated concentrations did not correlate with the observed value. Complete data listings of traffic volumes, running times, traffic and parking characteristics, intersection capacities, meteorology, CO concentrations, and sensitivity of the proposed methodology are given in the appendices.

47337 **APTIC NO. 67296**

Pervier, J. W., R. C. Barley, D. E. Field, B. M. Friedman, R. B. Morris, and W. A. Schwartz

SURVEY REPORTS ON ATMOSPHERIC EMISSIONS FROM THE PETROCHEMICAL INDUSTRY VOLUME II (FINAL REPORT). *Air Products and Chemicals, Inc., Marcus Hook, Pa., Houdry Div., Office of Air and Water Programs Contract 68-02-0255, EPA-450/3-73-005-b, 210p., April 1974.*

Survey reports were made of atmospheric emissions from the petrochemical industry. Most petrochemicals which fall into one or more of the classifications of large production, high growth rate, and significant air pollution are included. The processes for the production of each of these selected chemicals was studied and the emissions from each tabulated on the basis of data from an industry questionnaire. A survey report prepared for each process provides a method for ranking the significance of the air pollution from these processes. A total of 33 survey reports are completed. This volume contains information on carbon disulfide, cyclohexanone, dimethyl terephthalate and terephthalic acid, ethylene, ethylene dichloride via direct chlorination, formaldehyde manufacture with silve catalyst, glycerol, hydrogen cyanide, and isocyanates. For each process the report includes a process description, a process emission inventory, a catalog of emission control equipment, a list of producers, and an evaluation of the significance of the air pollution from the process. (Author abstract modified)

47338 **APTIC NO. 69562**

Rancitelli, L. A., K. H. Abel, and W. C. Weimer

TRACE POLLUTANT EMISSIONS IN FOSSIL FUEL COMBUSTION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 17-19, April 1974.*

NTIS: BNWL-1850 PT3

Trace element emissions from the Centralia Steam Plant in Centralia, Washington are characterized and estimated in terms of annual emission rates and annual elemental deposition rates. Estimates of emission levels using coal and fly ash samples collected from the facility and assuming 99% efficiency for the electrostatic precipitators used at the station indicate that substantial quantities of selenium, mercury, arsenic, cobalt, chromium, and iron (8300, 2250, 155, 290, 720, 220,000 kg/yr, respectively) are released. Annual estimated depositions, assuming 100% deposition of particulates within a semi-circular area of 192 sq km are 0.8, 12.7, and 42.1 mg/sq m/yr for the potentially toxic elements arsenic, mercury, and selenium, respectively. Even though the ambient elemental concentrations in soil may not be significantly increased by these deposition rates, they can still present an environmental hazard if fly ash elements are more readily available for biological uptake than their soil derived counterparts.

47339 **APTIC NO. 65207**

Roberts, John W., Harry A. Watters, Carl A. Mangold, and August T. Rossano

COST AND BENEFITS OF ROAD DUST CONTROL IN SEATTLE S INDUSTRIAL VALLEY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-83.)*

In a study done in Seattle s Duwamish Valley, the impact of road dust on air quality was measured by obtaining dust emission factors for vehicles travelling at 10, 20, and 30 mph on gravel as well as dusty paved roads. The paving of gravel roads with an average daily traffic (ADT) over 15 is a least-cost method for reducing suspended particulates in the air in

Seattle. A Mark II Cascade Impactor was mounted on a trailer and towed behind a car to determine the concentration and size distribution of this dust. Each vehicle at 20 mph on unpaved roads contributed 7.0 lb of dust to the air, 1.8 lb consisting of particles smaller than 10 micron in diameter and 0.24 lb below 2 micron. Three to 8% by weight of this respirable dust was free silica, which is potentially toxic. The quantity of dust generated varies as an exponent of the speed. The concentrations of dust found in the air near a dry gravel road with an ADT of 250 reached 584 micrograms/cu m for an 8-hour work day. A 24-hour suspended particulate reading of 463 micrograms/cu m and 3.83 micrograms/cu m free silica was found beside a dusty paved road with an ADT of 18,000. Nineteen miles of gravel roads and 110 mi of dusty paved roads contributed 2,700 tons/yr of particulates, of which 700 tons were below 10 micron. The cleaning and paving of roads will produce benefits of $3,881,000 yearly in reduced cleaning, health care, sewer, vehicle operation, and road maintenance as well as an increase in property values. Clean roads can lower the cost of clean air in Seattle.

47340 **APTIC NO. 69628**

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp

OCCURRENCE AND DISTRIBUTION OF POTENTIALLY VOLATILE TRACE ELEMENTS IN COAL (FINAL REPORT). *Illinois State Geological Survey, Urbana, Ill., Environmental Protection Agency Contract 68-02-0246, Program Element 1AB013, ROAP 21ADD-72, Rept. EPA-650/2-74-054, 105p., July 1974. 57 refs.*

NTIS: PB 238 091/AS

Chemical analyses were made of 101 whole coal samples and of 32 separate fractions of four laboratory prepared (washed) coals. Trace elements determined were: antimony, arsenic, beryllium, boron, bromium, cadmium, chromium, cobalt, copper, fluorine, gallium, germanium, lead, manganese, molybdenum, nickel, mercury, phosphorus, selenium, tin, vanadium, zinc, and zirconium. In addition, the following minor elements were determined: aluminum, calcium, chlorine, iron, magnesium, potassium, silicon, sodium, sulfur, and titanium. Standard coal analyses (proximate, ultimate, heating value, sulfur varieties, and ash) are also reported. Wherever possible, accuracy was evaluated by comparing results obtained by the various methods with results from splits of the same coal samples. Analytical procedures given in detail include: neutron activation, optical emission, atomic absorption, X-ray fluorescence, and ion-selective electrode. Certain techniques were chosen for determining specific elements because they are more accurate, their precision is superior, or they take less time for analysis. Further comparisons, based on analyzing whole coal and its low-and high-temperature ashes, permitted a thorough evaluation of trace-element losses resulting from volatilization during sample preparation. (Author abstract)

47341 **APTIC NO. 70148**

Sanders, Merwyn

PROGRAMMATIC DESCRIPTION FOR ENVIRONMENTAL MONITORING AND POLLUTION ABATEMENT AT THE Y-12 PLANT. *Atomic Energy Commission, Div. of Operational Safety, Proc. A.E.C. Environ. Prot. Conf., 2nd, Albuquerque, N. Mex., 1974, p. 577-602. 4 refs. (April 16-19.)*

NTIS: WASH-1332(74) Volume 1; GPO

The Oak Ridge Y-12 Plant, operated by the Union Carbide Corporation for the U. S. Atomic Energy Comission, processes waste material involving potential environmental hazards. To ensure safety operating conditions, extensive environmental sampling programs are maintained. A variety of unique techniques for pollution abatement are discussed with emphasis on an effective waste management program for a large-scale industrial complex. Prefilters, medium efficiency, high efficiency, high efficiency particulate, and bag filters, as well as wet scrubbers, are used to clean gaseous exhausts. In 1973, the total radioactive particulate material released to the atmosphere from these systems was 0.36 curie. The steam plant emits sulfur dioxide, nitrogen oxide, fluorine, and fly ash wastes. Chlorine is emitted by the electrolytic cells, hydrogen fluoride is emitted by the fluid bed hydrifluorination of uranium oxide to uranium fluoride, organic solvents are emitted by fabrication, and NOx are emitted by uranium and thorium pickling, uranyl nitrate evaporation, and denitration. Various control methods are used to reduce these emissions. Liquid pollutants and their control are also reviewed. (Author abstract modified)

47342 **APTIC NO. 70132**

Savery, C. William, Richard A. Matula, and Thomas Asmus

PROGRESS IN DIESEL ODOR RESEARCH. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1974. 41 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740213.)*

A review of diesel odor research is presented. The intensity of odors emitted by diesel engines operated at steady conditions is greatest at the idle and heavily loaded conditions. Cursory acceleration tests in which emitted hydrocarbon distributions increased suggest that variable load conditions may give rise to the worst odor condition. Diesel odor is characterized as having two important odor notes: oily-kerosene and burnt-smoky. Classes of compounds associated by odor panel characterization with the oily-kerosene odor note include: alkyl benzenes, indenes, alkyl indans, and tetralins; each of these odorous species has been separated from diesel fuel. Structural classes of components which contribute to the smoky-burnt odor note are oxidized derivatives generally of the same classes of compounds associated with the oily-kerosene odor note, with the most significant species being the functional benzenes and indanones. Commonly cited sources of unburned hydrocarbons which include the wall quench layers, crevice quench zones, and pockets of fuel-air mixtures which are either too rich or too lean to burn rapidly are considered likely sources of the oily-kerosene note. Odor detection methods which have been developed to date include those mehtods which rate overall odor intensity and those which classify odors by both quality and intensity. In contrast to these absolute measurements, odors intensity can also be measured against as standard. The generally accepted standard for diesel odor quality and intensity is the Turk Kit which contains four odor scales for qualities described as burnt/smoky, oily, pungent/acid, and aldehydic/aromatic.

47343 **APTIC NO. 68302**

Schikarski, Wolfgang

THE PROSPECTIVE EFFECTS OF POWER CONSUMPTION IN THE FEDERAL REPUBLIC OF GERMANY ON THE ENVIRONMENT. *(Die voraussichtlichen Auswirkungen des Energieverbrauchs in der Bundesrepublik Deutschland auf die Umwelt). Text in German. Elektrizitaetswirtschaft, 73(19):535-540, 1974. 7 refs.*

Based on the prospective consumption of primary energy the emissions of pollutants and heat related to power consumption are calculated for 1985 for the Federal Republic of Germany. A calculation of emissions on the basis of fuel consumption shows that carbon monoxide is the pollutant emitted in the highest concentrations. Introduction of the term relative pollutant effect permits a comparison of the effects on the environment of various pollutants without exact knowledge of the regional or local emission concentration. The term is based on the measured vertical distribution and dwell times of the various pollutants and calculates a hypothetical average pollutant concentration in a cell above the area of the Federal Republic of Germany. A comparison of the relative pollutant effects of various pollutants shows that sulfur dioxide and dust are the dominant pollutants. Measures which will be taken to reduce the SO2 emissions include coal desulfurization in coal-operated power plants, desulfurization of middle distillates for reduction of the SO2 emissions from domestic heating, flue gas desulfurization for oil-operated power plants, and fuel oil desulfurization for both power plants and industry. These measures are expected to reduce the SO2 emission by 1.28 million tons per annum at a total cost of $388 million/annum.

47344 **APTIC NO. 65674**

Schuler, M. T.

ASPECTS OF ENVIRONMENTAL PROTECTION WITH THE NOVEL CHEMICAL MATERIAL BAREX. *(Aspekte des Umweltschutzes beim neuartigen Chemiewerkstoff Barex). Text in German. Kunststoffe, 21(8):21-25, 1974. 7 refs.*

Barex 210 is the first representative of a new generation of artificial resins for the manufacture of wrappings, primarily wrappings for food, cosmetics, and medicines. The wrappings are light-weight (specific weight 1.15), transparent, rigid, resistant to scratching, and impermeable to oxygen and carbonic acid gas. They are resistant to many acids, lyes, and solvents and have blocking properties for odors. Barex production wastes can be easily recycled. Barex returned from resin manufacturers can be recycled several times. Yellow discoloration can be avoided by mixing recycling material with 60% new material. Wrappings made of Barex are completely inert and can be tipped like many other plastics without problems. Bottles made of Barex are flattened at a depth of 2 m so that they do not form any hollow space. Barex cannot be biologically decomposed thus it cannot be composted. Barex is made from mineral oil and has a high heating value, 7305.6 kcal/kg Barex. It can be incinerated without difficulties and does not incrustate the grate like polyethylene, polypropylene, and polystyrol. In Switzerland more than 50% of the plastic containing trash is burned in incinerators. Plastics generally constitute a fraction of 3% by weight, to which Barex contributes less than 1%. Barex yields the same harmless combustion products as plastic lined paper cartons for milk. Barex is incinerated.

47345 **APTIC NO. 69660**

Schwartz, W. A., F. G. Higgins, Jr., J. A. Lee, R. Newirth, and J. W. Pervier

ENGINEERING AND COST STUDY OF AIR POLLUTION CONTROL FOR THE PETROCHEMICAL INDUSTRY VOLUME 3: ETHYLENE DICHLORIDE MANUFACTURE BY OXYCHLORINATION (FINAL REPORT). *Air Products and Chemicals, Inc., Marcus Hook, Pa., Houdry Div., Office of Air and Waste Management Contract 68-02-0255, Rept. EPA-450/3- 73-006-c, 104p., Nov. 1974. 17 refs.*

The manufacture of ethylene dichloride (EDC) by oxychlorination was investigated to determine the extent of air pollution. Atmospheric emissions consist of ethylene, non-methane hydrocarbons, carbon monoxide, and hydrogen chloride. There may be small quantities of chlorine, but virtually no oxides of sulfur or nitrogen. The average emission factor for the process is about 0.035 lb/hr of EDC produced; over half is due to chlorinated hydrocarbons, and 1/6 each is due to ethylene and CO. In 1973 total atmospheric emissions were 120 million lb/yr. There is no technique for significantly reducing emissions available. Feasible control techniques and their costs are discussed, and research concepts that could lead to reduced emissions are proposed. (Author summary modified)

47346 **APTIC NO. 69524**

Schwarzbach, E.

NITROGEN OXIDES FORMATION IN NATURAL GAS FIRING EQUIPMENT. *(Zur Frage der Entstehung von Stickstoffoxiden bei Erdgasfeuerungen). Text in German. Preprint, p. 15-19, 1974. 10 refs. (Presented at the Nitrogen Oxides Colloq., Duesseldorf, West Germany, Sept. 12-13, 1974.)*

Studies on nitrogen oxides formation in natural gas firing equipment are reviewed. Nitrogen oxides, formed at temperatures above 1000 C, are emitted in unchanged or, compared with coal firings, slightly reduced quantities by large-capacity boilers converted to natural gas. Small-capacity domestic gas burners emit even more nitrogen oxides due to air excess and high temperature than comparable firing equipment operated on solid or liquid fuel. The nitrogen dioxide concentrations in the flue gases of domestic heating equipment and gas torches were between 1 and 22.4 mg/cu m.

47347 **APTIC NO. 69235**

Shigeta, Yoshihiro

EXAMPLES OF BAD ODOR MEASUREMENT DESIGNATED BY THE BAD ODOR CONTROL LAW, AND SENSITIVITY TEST. *(Akushu boshiho ni yoru akushu sokutei no jitsurei oyobi kanno shiken). Text in Japanese. Preprint, Bad Odor Pollution Study Group (Japan). p. 46-54, 1974. (Presented at the Bad Odor Pollution Control Seminar, 2 nd, Tokyo, Japan, July 23-24, 1974.)*

Analysis of odors from two craft paper plants by gas chromatography revealed that major components were hydrogen sulfide, methyl mercaptan, methyl sulfide, and dimethyl disulfide. The concentrations of the four components at a location 300 m away from plant were 42 ppb, 31 ppb, 14 ppb, and 2 ppb, respectively, and the odor concentration was 50; the concentration of these components in blow gas or exhaust gas in the plants could reach several hyndred ppm. The odor concentration was measured by the three point comparative type method. In addition to above four components, ammonai was found at the animal waste treatement plant. Analysis of exhaust gases from petroleum chemcial plant showed 65.7 ppm formaldehyde, 218.9 ppm acetaldehyde, and 1.16 ppm propionaldehyde. After combustion-deodorization, the concentrations were reduced to 0.25 ppm, 0.15 ppm, and undetectable, respectively. Other components from petroleum chemical plants included ethyl acetate, isobutanol, n-butane, ammonia, and hydrocarbons.

47348 **APTIC NO. 69946**

Smith, Wayne E. and John R. LaShelle

CHARACTERIZATION OF ATMOSPHERIC EMISSIONS FROM POLYURETHANE RESIN MANUFACTURE (FINAL REPORT). *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-0228, Task 38, ROAP 21AXM-60, Program Element 1AB015, EPA-650/2-74-107, 87p., Oct. 1974. 13 refs*

NTIS: PB 237420/AS

Air pollutant emissions from a polyurethane resin manufacturing plant were characterized, with samples being taken before and after the air pollution control device (scrubber). Analysis for toluene diisocyanate (TDI) and amines was conducted both on site and on a delayed basis. The sampling tain included an impinger for colorimetric measurement of TDI, and cryogenic traps and a tape sampler for TDI were used for scrubber inlet samples. The outlet sampling manifold consisted of evacuated bulbs in place of the cryogenic traps because of the high moisture content. Emissions were greatest during the first part of the resin formation reaction, during which an exotherm occurs from 150-200 F. Inlet and outlet scrubber streams contained mainly nitrogen, mineral spirits, and TDI. The aqueous scrubber removed very little TDI during the tests. Scrubber outlet composition during the peak 1-hour emission period averaged: 97.5% nitrogen (by volume), 2.5% mineral spirits (by volume), and 1.2 ppm TDI (by volume). Total emission of TDI was about 0.000000018 lb TDI/lb product. The maximum ground-level concentration of both TDI and mineral spirits was about 0.1% of the maximum allowable value for an 8-hour averaging period.

47349 **APTIC NO. 70295**

Strahm, E.

EXPERIENCES WITH EMISSION MONITORING IN THE SWISS CEMENT INDUSTRY. *(Erfahrungen in der Emissionsueberwachung bei der schweizerischen Zementindustrie). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 182-193. (June.)*

Since the beginning of 1974 the dust emission by cement works in Switzerland has been limited to a maximum of 100 mg/cu m for old plants and to 75 mg/cu m for modern plants. These values may not be exceeded in long-term operation. For emission monitoring a conventional gravimetric measurement method is used. First the gas quantity and the gas condition is determined; then the dust content of the gas is measured. Swiss regulations demand that dust collectors used in the cement industry be officially inspected once every 2 yr. Dust collectors used in the cement industry usually operate according to the dry filtering method and return the separated dust to the production process; the furnaces are usually equipped with electrostatic precipitators for dust collection; the grinding stations either use fiber filters or electrostatic precipitators; and the remaining dust sources use cloth filters. On the average, 15 cloth filters are installed per cement work with a total of about 1500 bags and filter area of 2900 sq m. The dust emission of the cement industry in the past decade could be reduced to one quarter of the value of 1964 despite a 40% production increase.

47350 **APTIC NO. 69295**

Suzuki, Seiichi

PROBLEMS OF AND CONTERMEASURES FOR PAINT SOLVENTS. *(Toryo yozai no mondaiten to taisaku). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 18(7):15-18, July 1974.*

The disappearance of paint solvent from the market and their subsequent shortage began before the 1973 oil crisis. Paint thinner is a supplementary product used for adjusting paint viscosity and cleaning equipments, yet it is necessary for complete painting operations. The background of the shortage is discussed. The use of solventless or low solvent paint such as water-base paint and powder paints is significant from the viewpoint of pollution control. The use of radiation-induced polymerization paint and hot-type paint are other possibilities. The cost for solventless powder paint is not much different from that of liquid paints, and the equipment cost for the painting process is not unbearable. The production of powder paints is presently planned by many paint producers. The problems presented by water-base paint such as the treatment of waste water and sludge, atmospheric pollution, and problems in powder paint coating in closed systems are discussed. The improvement in coating efficiency is one overlooked aspect of control measures. The coating efficiency of 25-30% by hand spraying can be improved to 85-90% by the electrostatic spraying. A decrease in paint consumption results in a decrease in solvent consumption. The cost required for the use of new types of paint, coating techniques, and equipment should be evaluated as a total system. The pattern of paint pollution by the small painting factory, problems presented by spray coating, air pollution by spray mist, and malodor are discussed in reference to the emission standards at outlet, 200 ppm for solvent, 50 ppm for benzene, 100 ppm for trichloroethylene, and 100 ppm for tetrachloroethylene. The contribution of paint solvents to photochemical smog formation is discussed. Control by enforcement of various pollution standards is also discussed.

47351 **APTIC NO. 65544**

Ter Haar, G. L., M. E. Griffing, M. Brandt, D. G. Oberding, and M. Kapron

METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL AS AN ANTIKNOCK: COMPOSITION AND FATE OF MANGANESE EXHAUST PRODUCTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1974. 10 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-199.)*

Exhaust products from the combustion of methylcyclopentadienyl manganese tricarbonyl (MMT) are described and the rate of photolytic decomposition of MMT was determined. Two cars were periodically checked for manganese emissions by collecting the exhaust from the 7 mode Federal Cycle in a 3500 cu ft black bag. Particle size data for Mn were nearly identical to data on lead particles emitted from a similar car operating on leaded fuel. X-ray diffraction data show that the Mn exhausted is mainly Mn304. Only traces of unburned MMT were exhausted, less than 0.5% of the Mn burned, usually less than 0.1%. Almost all of the Mn is converted to a mixture of Mn oxides and carbonates. The use of MMT in gasoline is not a public health hazard because of the low toxicity of Mn and because of the low concentration (maximum 0.125 g Mn/gal) of MMT that would be used in gasoline. If all gasoline contained 0.1 g of Mn/gal, the amount of airborne Mn emitted in urban areas would be only 0.02-0.2 micrograms/cu m, with a median value of 0.05 micrograms/cu m. (Author abstract modified)

47352 **APTIC NO. 68450**

Tschamler, Hubert

PLASTIC MATERIALS AND THE ENVIRONMENT. *(Kunststoffe und Umwelt). Text in German. Osterr. Chem. Z., 75(10):19-20, 1974.*

General environmental problems of plastic wastes are discussed. While polyethylene, polypropylene, polystyrene, and related products release water and carbon dioxide when incinerated, polyvinyl chloride releases hydrochloric acid which is corrosive and causes air pollution. The corrosion hazards were determined by the actual combustion and operating conditions in incinerators rather than by the amount of the corrosive gases. The HCl emitted by waste incinerators is negligible as it is to a great part adsorbed by particulate matter and even neutralized by basic components of the flue gas. In addition, modern incinerators are equipped with efficient exhaust control devices. In general, the amount of HCl generated from PVC in incinerators is smaller than that formed from paper, vegetables, and coal.

47353 **APTIC NO. 69694**

Tsukamoto, Yasuhiro

ON THE DISPOSAL OF PULP SLUDGE SEDIMENTED IN THE TAGONOURA HARBOR. *(Tagonoura-ko chinden odei no umetate jikken). Text in Japanese. Shizuoka-ken Kogyo Shikenjo Hokokusho (Rep. Shizuoka Ind. Res. Inst.), no. 18:91-110, Feb. 1974. 14 refs.*

To investigate a safe and efficient method of using pulp sludge dredged from Tagonoura harbor for reclamation of shoreland, experiments were conducted using 76.5 cu m of dehydrated sludge and 13.5 cu m of soil. The amount of hydrogen sulfide produced increased proportionally to the sludge layer thickness up to 4 m. In the case of two sludge layers with a soil layer in- between, the amount of H2S was reduced by 14% compared to the single layer of sludge covered with soil. The rates of reduction in H2S produced by covering the sludge layer with soil were 31% in the case of a sludge: soil ratio of 8 : 2 and 20% for a sludge : soil ratio of 9 : 1. The use of chemicals such as ammonium nitrate and a mixture of lime and ferrous chloride was relatively ineffective. The civil engineering factors such as reclamation depth, reclamation method, and ratio sludge and soil had little effect on sludge decomposition. The sludge decomposition rate varied greatly with the type of chemicals added and the sludge temperature.

47354 **APTIC NO. 69282**

Tsuritani, Taiichi

LABOR HEALTH, POLLUTION CONTROL, AND PROTECTION MEASURES FOR RESOURCES. *(Rodo eisei,* *kogai boshi, shigen kankyo no taisaku). Text in Japanese. Insatsu Zasshi (Print. J.), 57(7):3-14, 1974. 14 refs.*

The work environment of gravure printing contains various pollutants such as toluenes, ethyl acetate, and MEK solvents in the forms of waste gas, dusts, steam, mist, fumes, and lead particles. The dispersion of these pollutants into the outside air will cause health damages and discomfort when a certain level of concentration and time accumulation are reached. The treatment of a work area atmosphere should be a closed system in which toxic pollutants are shut off from the humans by some means. The methods include not only the treatment or removal of waste gases, but also automation or remote control of production processes, changes of materials, improvements of facilities (air-tight enclosures for instance), or partitions in workshops. In a small plant of 300 sq m with several printing machines, starch powders are sprayed for the prevention of print-through; the starch dusts are collected by suction into the hood with a grid under the printing machine, and in the underground dusts, the air is filtered through; also a bag filter in the workshop collects the dusts and the total ventilation in the workshop keeps the environment clean and comfortable. The total production of paint in Japan in 1973 was 1.5 million tons; if the entire amount was used for coating and if about 40% of the solvent evaporated, it means that the atmosphere now contains at least 0.6 million tons of organic solvent vapor. The terminal degradation of organic materials leads to water vapor and carbon dioxide; but if enough carbon dioxide accumulates in the atmosphere, the result will obviously be a disaster.

47355 **APTIC NO. 69918**

Vertis, Alexander Stephen

ENVIRONMENTAL CONSIDERATIONS IN POWER DISPATCH. *Pennsylvania Univ., Philadelphia, Dept. of Electrical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-2474, 1974, 170p. 24 refs.*

A supplementary regulation scheme defined as a minimum emission dispatch is developed for the achievement of minimum environmental impact by power generating stations. All principal forms of pollution associated with power generation are considered and include the emission of sulfur dioxide, nitrogen oxides, and particulates into the atmosphere. An economic dispatch solution is first run for all forms of generation (fossil fuel, nuclear, gas turbine, hydroelectric). Minimum emission control is, however, imposed only on the fossil fueled units of the system. Power demand in a power balance equation of minimum emission dispatch is modified to exclude the power generated by the non-fossil fuel units. New concepts such as total emission function and the associated pollution function are introduced to allow for the creation of a flexible mathematical model. This model can account for variations in pollution concentrations, polluter types, and meteorological conditions. Although minimization of the overall emission level over a large geographical area is the primary goal of the control scheme, the control method is also sensitive to operating cost considerations and local pollution level requirements.

47356 **APTIC NO. 69309**

Vogl, J.

THE EMISSION INVENTORY AND THE NECESSITY OF DETERMINING THE EMISSIONS SPECIFIC TO VARIOUS INDUSTRIAL BRANCHES AND PRODUCTION PROCESSES. *(Das Emissionskataster und die Notwendigkeit der Ermittlung branchen- und produktionsspezifischer Emissionen). Text in German. Gesundh.-Ingr., 95(9):251-253, 1974. (Paper presented at the second Symposium on Branch-specific Emissions, Fluorine Emissions by Brick Kilns, Munich, Germany, Feb. 1, 1974.)*

In order to gain information on the air quality of a certain area a detailed emission inventory is required for which extensive data on the spatial distribution as well as size and type of single emission sources must be gathered. Although collection of these data has begun in Bavaria it is reckoned, that it will take several years to complete the emission inventory. For this reason, available sources of information as well as model calculations and approximations have to be used for working out the planned emission protection program. The emission inventory must include the emission sources such as industries, fossil and nuclear fuel-operated power production plants, domestic heaters, and automobiles. For determining the emissions by industrial production facilities existing statistical data such as density of industries in the area and throughput must be used, which is risky with regard to accuracy. The inaccuracy can be reduced somewhat if a differentiation of the various production processes is introduced. The the creation of the emission protection program in Bavaria only sulfur dioxide, oxides of nitrogen, hydrocarbons, carbon monoxide, hydrogen fluoride, and dusts are taken into account. For better comparison of the pollution in various regions an evaluating scheme on the basis of an emission matrix was used which groups the various emission sources according to type and quantity of emitted pollutants into four categories and with which the emissions by each individual industrial branch can be determined.

47357 **APTIC NO. 65184**

Walker, A. B.

CHARACTERISTICS AND ELECTROSTATIC COLLECTION OF PARTICULATE EMISSIONS FROM COMBUSTION OF LOW SULFUR WESTERN COALS. *Preprint, Air Pollution Control Assoc., 23p., 1974. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-11.)*

About 90% of the known strippable low-sulfur coal reserves in the U. S. are in the area west of the Mississippi River. These coals can meet sulfur oxide emission regulations without the need for flue gas desulfurization. The principal use of these coals will be as fuel for conventional biolers which will require particulate removal efficiencies in excess of 99%. The emission characteristics and electrostatic precipitator performance tests on these coals are described. Mass emissions as a percentage of fuel ash were somewhat lower than Eastern bituminous coals, but there was insufficient information to suggest deviation from currently available methods, based upon Eastern coals, for predicting ash carryover. Size distribution of particulate emissions on pulverized coal units was similar to that of Eastern bituminous coal. However, size distribution of particulates from Western coals in cyclone boilers was somewhat coarser than from the same fuel in pulverized coal units or predicted from available data on Eastern bituminous coals burned in cyclone boilers. Bulk electrical resistivity of Western fuel ash at typical air heater outlet temperatures varied over a wide range, could not be predicted on the basis of fuel sulfur alone, and generally was above the level where back corona would be expected. The bulk electrical resistivity of Western fuel ash, at typical air heater inlet temperatures, varied over a narrower range with most of the cases encountered being below the level where back corona would be expected. Precipitator performance can generally be correlated according to a modified form of the Deutsch equation. This indicates that specific collecting electrode areas in the range of 350-550 sq ft/1000 acfm are required for achievement of 99% on fly ash with in-situ resistivity levels in the range of 10 to the 10th to 10 to the 12th power ohm-cm; and that specific collecting areas as high as 900-1000 sq ft/1000 acfm may be required to achieve efficiencies in the 99.8% range. (Author abstract modified)

47358 **APTIC NO. 69609**

Watson, H. C., E. E. Milkins, and V. Balach

THE RELATIONSHIP BETWEEN ROADS, TRAFFIC PATTERNS, VEHICLE EMISSIONS AND EMISSIONS LEGISLATION. *Univ. of Melbourne, Parkville, Victoria, Dept. of Mechanical Engineering, Rept. T 18/74, 27p., Oct. 1974. 9 refs.*

A model for predicting the line source of vehicle emissions is reviewed along with its application to calculation of vehicle emissions control requirements and analysis of the benefits resulting from transportation planning, traffic control, and road improvements. The emissions data for the model are obtained from stationary vehicle tests or simulated driving patterns. Emissions measured continuously during these driving patterns can be fitted by regression analysis to explicit functions of vehicle speed and acceleration. Application of the model to traffic flowing along a specific route in Melbourne indicates that vehicle exhaust emissions contain more carbon monoxide and less nitrogen oxides and hydrocarbons than expected from base line measurements according to the test cycle to be adopted as the Australian standard in 1976. Thus, the validity of using the emission numbers obtained over this test cycle in calculating the dependence of ambient air quality on vehicle emissions is questioned.

47359 **APTIC NO. 65543**

Wright, W. E., G. L. Ter Harr, and E. B. Rifkin

THE EFFECT OF MANGANESE ON THE OXIDATION OF SO2 IN THE AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1974. 13 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-198.)*

The effect of manganese on the oxidation of sulfur dioxide in the air was investigated because of the proposed usage of methylcyclopentadienyl manganese tricarbonyl (MMT) as an antiknock agent in gasoline at concentrations of 0.125 g Mn/gal or less. If all U. S. gasoline contained 0.1 g Mn/gal, average concentrations in urban air would increase by 0.02 to 0.2 micrograms/cu m with a medinn increase of about 0.05 micrograms/cu m. Published literature data extrapolated downward to concentrations of airborne Mn within this range show that the effect of Mn in accelerating SO2 oxidation is totally negligible. Solution studies show that in acid media, where the uncatalyzed SO2 oxidation rate is slow and where the effect of catalysts is most evident, the anticipated concentration of Mn is not sufficient to cause any significant increase in SO2 oxidation rate. Neutral solutions oxidize much more rapidly, but the effect of catalyst is lessened. Basic solutions oxidize very rapidly, and any effect of catalysts would not be of practical consequence. Simulated atmospheric studies show that the anticipated concentrations of manganese would not accelerate SO2 oxidation, but that the normal amount of ammonia in the air is the rate controlling factor in atmospheric SO2 oxidation. (Author abstract modified)

47360 **APTIC NO. 69977**

Yamate, George

EMISSIONS INVENTORY FROM FOREST WILDFIRES, FOREST MANAGED BURNS, AND AGRICULTURAL BURNS (FINAL REPORT). *IIT Research Inst., Chicago, Ill., Environmental Protection Agency Contract 68-02-1389, IITRI Proj. C6306, Rept. EPA-450/3-74-062, 34p., Nov. 1974.*

NTIS: PB-236 766/AS

The area source inventories on emissions from forest wildfires, forest managed burns, and agricultural burns were compiled for each of the 55 states and territories. Reliable data and information obtained on acreages burned and tons of fuel burned per acre for each of the 3100 counties and jurisdictional entities in the country are summarized. Literature searches, letters, telephone call, and personal contacts were used in obtaining the results. The most reliable data were selected and entered on the National Emissions Data System (NEDS) area source coding forms. The values obtained are the best and most reliable for these burning activities. No estimates were recorded for locations that had no available data or information. (Author abstract modified)

47361 **APTIC NO. 69855**

Yokota, Hisashi, Masataka Sofuku, Atsuko Kobayashi,
Tokiko Tsukada, Kinji Nakano, and Toshio Ohira

THE REACTIVITY OF HYDROCARBONS DURING THE IRRADIATION OF AUTOEXHAUST. *(Jidosha haigasu shosha jikken niokerutankasuiso no kokagaku hannosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air pollution), 9(2):155, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 8.)*

Automobile exhaust gases at idling and driving conditions were introduced into a Teflon smog chamber and irradiated with ultraviolet light to examine the contribution of hydrocarbons to photochemical smog. Concentrations of carbon monoxide, ozone, and nitrogen oxides were monitored. The results are summarized by relative concentrations (taking the initial isopentane concentration as 1) of hydrocarbons after 5 hr of UV irradiation. Propylene diminished greatly during the experiments, then xylene, ethyl toluene, and trimethylbenzene, respectively; the losses of ethane, ethylene, pentane, toluene, and ethyl benzene were relatively small.

47362 **APTIC NO. 65841**

Zeedijk, H.

ENERGY CONSUMPTION, OIL CRISIS AND SO2-GENERATED AIR POLLUTION IN THE NETHERLANDS. *(Energieverbruik, oliecrisis en luchtverontreiniging door SO2 in Nederland). Text in Dutch. Chem. Weekblad, 10(28/29):17-19, July 12, 1974.*

The evolution of energy consumption and sulfur dioxide emissions in the Netherlands is outlined with respect to the 1973-1974 oil crisis. The percentage of natural gas as energy carrier rose from 15% in 1967 to 43% in 1972, and is expected to exceed 50% in 1973. This development parallels a progressive reduction of the share of fuel oil as a result of the recent oil crisis and soaring price of this fuel, while the share of coal shows an upward trend, especially in power plants. The share of coal firing in the total SO2 emission is 10% against 25% in 1967. The respective shares of diesel fuel and fuel oil in the total SO2 emission show a decline due to the reduced consumption, and the share of sulfuric acid production plants is fairly steady despite increasing production as a result of improved technologies. The bulk of the SO2 emission is more and more concentrated in petroleum refineries. The overall SO2 emission in the Netherlands has shown a downward trend since 1969.

47363 **APTIC NO. 67095**

Environmental Protection Agency, Needham Heights, Mass.,
Surveillance and Analysis Div.

VINYL CHLORIDE MONOMER SURVEY AT BORDEN CHEMICAL. *Preprint, 38p., May 1974.*

Vinyl chloride monomer was measured in 24-hour samplings on May 9, 10, and 13, 1974 at the Borden Chemical plant which manufactures industrial organic chemicals. Approximately 100,000 tons of polyvinyl chloride (PVC) are produced annually. Waste water sources and treatment facilities were studied. Vinyl chloride concentrations were detected in the water, sludge, and waste water samples. Meteorologic variables at the site were noted. Grab samples using glass gas syringes and Tedlar bags and 24-hour integrated samples using charcoal columns were used to monitor the air at stations in residential, industrial, residential-industrial, and rural areas around the plant. Spot samples were taken whenever odors from acetate and acrylate were noticed. Appendices are given which describe the PVC manufacturing process and which present the results of the water and air monitoring.

47364 **APTIC NO. 67096**

Environmental Protection Agency, Dallas, Tex.

MONITORING REPORTS ON VINYL CHLORIDE. VINYL CHLORIDE MONITORING AT THE

GOODYEAR TIRE AND RUBBER CO. AND THE DOW CHEMICAL CO., PLAQUEMINE, LOUISIANA. *Preprint, 16p., 1974.*

Emissions of vinyl chloride were monitored at the Goodyear Tire and Rubber Co. and the Dow Chemical Co., Plaquemine, La. The Goodyear plant manufactures approximately 100 million tons/yr of polyvinyl chloride. The Dow Chemical Co. makes 9 million tons/day of chlorinated compounds including vinyl chloride monomer. Waste water and ambient air near the plant were measured, and results are given. Vinyl chloride concentrations, in the ambient air at the Goodyear plant were 0.003-7.81 ppm at the property lines, 0.000-0.34 ppm at 0.5 mi, 0.000-0.17 ppm at 0.75 mi, 0.002-0.181 ppm at 2 mi, and 0.000-0.001 ppm at 3 mi.

47365 **APTIC NO. 67097**

Environmental Protection Agency, San Francisco, Calif., Office of Enforcement

MONITORING REPORTS ON VINYL CHLORIDE. EVALUATION OF VINYL CHLORIDE EMISSIONS IN THE LONG BEACH AREA, CALIFORNIA. *Preprint, 35p., May 1974.*

Vinyl chloride monomer (VCM) was measured in the process wastes from the B. F. Goodrich and American Chemical Corp. plants in an industrialized area of Long Beach, Calif. The plant processes, the sampling methods, and results of the survey are described. Waste water and air were examined for the presence of VCM. Ambient air quality was evaluated by 10-minute grab sampling, 24-hour composite sampling, and 24-hour continuous sampling within the two plants and in the area of the plants. The effects of winds and other meteorological variables on the sampling were noted.

47366 **APTIC NO. 67098**

Environmental Protection Agency, Surveillance and Analysis Div.

VINYL CHLORIDE STUDY. *Preprint, 12p., June 12, 1974.*

A program to monitor vinyl chloride in the vicinity of polyvinyl chloride plants is described. Most of the air monitoring effort was centered around two plants, Diamond Shamrock and Stauffer Chemical, in Delaware City, Delaware. Water from the Union Carbide plant in South Charleston, W. Va. was also measured. Sampling and analytical methods, calibration methods, and results are described. Vinyl chloride was found in the air and water near the sources. Monitoring should continue on a more systematic basis.

47367 **APTIC NO. 67099**

Environmental Protection Agency, New York, Office of Enforcement and General Counsel

VINYL CHLORIDE MONOMER INVESTIGATION. TENNECO CHEMICALS, INC. FLEMINGTON, NEW JERSEY. *Preprint, 71p., June 1974.*

Vinyl chloride monomer, a toxic chemical, was measured near a vinyl chloride plant located near Flemington, N. J. in the air and water. Polyvinyl chloride resin is manufactured at the plant by batch polymerization of vinyl chloride monomer. The vinyl chloride in the stack gas was 630 ppm. Vinyl chloride was also found in the waste water discharged, solid wastes, and polyvinyl chloride products. Within 2 mi of the plant, the vinyl chloride concentrations were in discrete samples 0.01 to 5.6 ppm. On the dryer building roof next to the vent was the highest concentration. At ground level, the concentrations ranged from 0.01 to 0.30 ppm. An air concentration of 0.07 ppm was found over the waste water inflow to the plant lagoon system. Integrated 24-hour samples had vinyl chloride monomer concentrations of 0.005-0.038 ppm on plant property and from less than detectable to 0.031 ppm outside the plant area. Integrated 1-hour air samples collected within 0.1 mi of the plant showed vinyl chloride present; samples easterly from the plant had 0.32 ppm; samples near the south side of the plant had 0.18 ppm. The sampling program, sampling methods, and results are described in detail.

47368 **APTIC NO. 67100**

Environmental Protection Agency, Surveillance and Analysis Div.

VINYL CHLORIDE SURVEY. UNIROYAL CHEMICAL. UNIROYAL PVC RESINS, INC. (ROBINTECH). PAINESVILLE, OHIO. *Preprint, 57p., May 1974.*

A survey to ascertain and quantify the presence of vinyl chloride in the ambient air, water, and solid waste discharges from the Uniroyal Chemical and Universal PVC, Inc. (Robintech) is described. The ambient air was surveyed by continuous 24-hour monitoring and grab-sampling techniques from May 9 to May 10 and May 13 to May 14, 1974. The impact of wind and other meteorological variables was noted. The analytical methods and results are described. The maximum vinyl monomer chloride (VCM) measured downwind of Uniroyal was 0.42 ppm, with upwind reading less than 0.03 ppm. On four occasions the upwind concentration was greater than the downwind concentration, possibly due to sampling error or gustiness of wind. Upwind concentrations were less than 0.03 ppm to 0.18 ppm VCM. The maximum reading downwind of Robintech was 2.26 ppm VCM; the corresponding upwind reading was 0.09 ppm. Carbon train sampling results ranged from 0.20 to 0.60 ppm VCM at Robintech.

47369 **APTIC NO. 67101**

Environmental Protection Agency, Atlanta, Ga., Surveillance and Analysis Div.

MONITORING REPORTS ON VINYL CHLORIDE. AMBIENT AIR SURVEILLANCE. B. F. GOODRICH CHEMICAL COMPANY. LOUISVILLE, KENTUCKY. *Preprint, 56p., May 23, 1974.*

Ambient air concentrations of vinyl chloride were measured in the vicinity of the B. F. Goodrich Chemical Company in Louisville, Kentucky from May 8 through May 16, 1974. The field investigation, laboratory analytical procedures, and analytical data are described. The chemical company manufactures synthetic resins and synthetic rubber including polyvinyl chloride resins, latexes and compounds; acrylonitrile rubber and latexes; styrene and butadiene resins and latexes; and acrylonitrile, butadiene, and styrene plastic resins and compounds. Integrated samples were taken to determine the 24-hour average exposure of local residents and employees of neighboring industries. Grab samples were taken to better identify the high concentrations and dispersion. The chemical processes at the plant, the air quality sampling methods, the meteorology in the area, and the sites are described. Results are presented.

47370 **APTIC NO. 67117**

Bureau of Mines, Washington, D. C., Div. of Fossil Fuels, Mineral Supply

ASSESSMENT OF THE IMPACT OF AIR QUALITY REQUIREMENTS ON COAL IN 1975, 1977, AND 1980 (FINAL REPORT). *237p., Jan. 1974. 7 refs.*

Future supply/demand patterns for coal in relation to air quality standards in the electric utility, industrial, and residential/commercial markets of the United States are estimated for the years 1975, 1977, and 1980. Coal demand by electric utilities is forecast to increase from 1972 at average annual rates of 6.4% to 1975, 6.1% to 1977, and 6.5% to 1980, while requirements in the industrial and residential/commercial sectors are forecast to remain relatively stable. On the basis of estimated sulfur standards, it is estimated that for the consuming sectors covered in the study at least 243 million tons in 1975, 254 million tons in 1977, and 275 million tons in 1980 will not meet requirements unless utilities which report anticipated coal supplies for new plants at sulfur levels above the standards meet the regulations either through the use of pollution control processes or through the use of coals with permissible sulfur levels. Assuming either of the latter, estimated deficits in meeting the standards in the consuming sectors will approximate 199, 194, and 190 million tons, respectively, for 1975, 1977, and 1980.

47371 **APTIC NO. 67130**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

SURVEY ON AIR POLLUTION EMISSION FACTORS. *Tokyo Metropolitan Research Institute for Environmental Protection 1-4-12, 91p., March 1974.*

A survey of air pollution emission factors for both stationary and mobile emission sources throughout the 23 wards of the metropolitan area of Tokyo, Japan is presented. The survey includes the calculation of emission factors for air pollutants and the calculation of their intensity and contribution rates by different sources. The total annual sulfur oxide emissions in 1972 was 81,599 tons with stationary sources accounting for 95.6% and mobile sources the remaining 4.4%; total nitrogen oxide emissions amounted to 96,364 tons, 31% being from stationary sources and 69% from mobile sources. Mobile sources accounted for 94.6% of the 593,221 tons of carbon monoxide emitted during 1972, while stationary sources accounted for 5.4%. Hydrocarbon emissions were 219,474 tons in 1972, with 32.9% being from stationary sources and 67.1% from mobile sources; total particulate matter was 22,824 tons, with 95.5% being from stationary sources. Mobile sources accounted for 87% of the 1316 tons of aldehydes emitted in 1972, with the remaining 13% being from stationary sources. Emission factor measurements are also broken down by type of facility.

47372 **APTIC NO. 69224**

THE TOTAL QUALITY CONTROL REGULATIONS FOR AIR POLLUTANT EMISSION - THE RECORD OF THE 11TH AREA COMMUNICATIONS COMMITTEE MEETING. *(Taiki osen no soryo kisei ni tsuite -- dai 11 kai chiiki renraku iinkai kiroku). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 80.81:2-44, Jan. - March, 1974.*

Environmental standards are classified as area standards, time standards, and substance standards. Area standards are the most common and have been stressed. Time standards for a given period are equally important and require enforcement. The sulfur dioxide concentration at the sea bank area of Mizushima can be as high as 0.0415 ppm in 1975. The concentration corresponds to a total emission of 5786 N cu m/hr. The environmental standard is set at 0.015 ppm which corresponds to 2398 N cu m/hr. At Kawasaki about 129,000 tons of SO2 was emitted per year. The 1- hour value was set at 0.1 ppm and the 24-hour value at 0.05 ppm. A total of 95,700 tons of SO2 was emitted in Yokkaichi in 1971. In 1974 the total emission is expected to be reduced to 47,230 tons which corresponds to a maximum environmental standard of 0.025 ppm. An environmental standard of 0.018 ppm in 1977 will further reduce the total emission to about 31,600 tons. In Osaka there were more than 50,000 fixed sources of nitrogen oxides. Only about 600 major contributors were considered point sources and each NOx emission was calculated while the rest were considered as area sources and the total NOx emission was estimated. The NOx from moving source was similarly calculated. The NOx from each major street was calculated while those from secondary streets were estimated as a whole from photographs taken by aircraft.

47373 **APTIC NO. 69354**

Environmental Protection Agency, Ann Arbor, Mich., Technology Assessment and Evaluation Branch

EMISSIONS FROM A MERCEDES-BENZ DIESEL CAR EQUIPPED WITH A TURBOCHARGER. *Rept. 75-10 AW, 8p., Oct. 1974. 1 ref.*

Emissions, fuel economy, and driveability tests (1975 Federal Test Procedure) were conducted on a 1971 Mercedes 220D (diesel) equipped with a turbocharger package designed for 1970-1973 Mercedes 220Ds. The basic package contained the turbocharger and plumbing necessary for the installation. The kit was designed to supply up to 10 psi pressure boost. The effect of the turbocharger kit on emissions was negligible. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions from the turbocharged vehicle were: 0.98, 2.67, and 1.66 g/mi, respectively, as compared to baseline values (non-turbocharged) of 0.87, 2.66, and 1.61, respectively. Fuel economy over the 1975 Federal Test Procedure and Highway Driving Cycle was also essentially unchanged. Driveability of the vehicle was very good, with no perceptible lag on acceleration.

47374 **APTIC NO. 69375**

CONSIDERATIONS IN CHOOSING ORGANIC COATINGS. *Finish. Highlights, 6(5):21, 25, July/Aug. 1974.*

Various considerations for choosing organic coatings are discussed including criteria, Federal regulations, and knowledge of coatings and processes available. Criteria must be established regarding the regulations governing the product and processes, ecology, functional properties, esthetic properties, investment, operating costs, energy requirements, and special constraints. The key to economically complying with OSHA regulations is to engineer conditions such that contaminant levels are below those specified by OSHA. The Clean Air Act of 1970 regulates sulfur oxides, nitrogen oxides, carbon monoxide, particulates, hydrocarbons, and oxidants. Hydrocarbon emission control is the coating industry s principal problem. Many states also regulate hydrocarbon emissions, but 30 states do not. Coating options include alkyds, epoxies, vinyls, polyesters, acrylics, and urethanes. Many of the coatings are becoming available in water form for electrodeposition or as conventionally applied products. High solids systems are getting increasing research and development attention because of their ability to reduce total emissions together with labor and cost savings. Process options available include liquid systems (conventional spray, electrostatic spray, dip-flow-coat-curtain coater, roll-coating- coil coating, and electrodeposition) and powder systems (fluidized bed, electrostatic fluidized bed, and electrostatic spray) Criteria must be evaluated before choosing a process, since the choice of process can affect costs and emissions.

47375 **APTIC NO. 69382**

Environmental Protection Agency, Washington, D. C., Office of Toxic Substances

PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH VINYL CHLORIDE AND POLYVINYL CHLORIDE. REPORT ON THE ACTIVITIES AND FINDINGS OF THE VINYL CHLORIDE TASK FORCE. *33p., Sept. 1974. 2 refs.*

The activities and findings of the Task Force on Vinyl Chloride are described. The Task Force was formed to assess the character and extent of the problems associated with the production, distribution, use, and disposal of vinyl chloride and polyvinyl chloride. The preliminary findings and conclusions are summarized. The nature and magnitude of the problems associated with vinyl chloride and polyvinyl chloride, previous and planned Federal activities of particular significance, the role of industry, and recommendations of the Task Force are discussed. Sources of exposure to vinyl chloride of special importance are described including pesticidal sprays, discharges from vinyl chloride/polyvinyl chloride plants, transportation accidents, and the unreacted monomer entrapped in polyvinyl chloride. The health effects, ecological effects, and persistance of vinyl chloride are also discussed.

47376 **APTIC NO. 69383**

Environmental Protection Agency, Washington, D. C.

PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH VINYL CHLORIDE AND POLYVINYL CHLORIDE (APPENDICES). REPORT ON THE ACTIVITIES AND

FINDINGS OF THE VINYL CHLORIDE TASK FORCE. *70p., Sept. 1974. 45 refs.*

Appendices are given on selected economic considerations, producers of vinyl chloride and polyvinyl chloride, materials balance and vinyl chloride and polyvinyl chloride facilities, an interim method for sampling and analysis of vinyl chloride in waste water effluents and air emissions by flame ionization detector, a summary of regional activities, persistence of vinyl chloride, health effects of vinyl chloride on humans and animals, disposal of products containing polyvinyl chloride, and activities of task force.

47377 **APTIC NO. 69689**

REDUCTION OF AIR POLLUTION BY AUTOMOBILE EXHAUSTS. *(Verminderung der Luftverunreinigung durch Autoabgase). Text in German. Wasser Luft Betrieb, 18(9):513-516, 1974. 7 refs.*

A review is given of the causes for pollutant emissions by automobiles, of the methods for combating this pollution, and the existing legislation in the Federal Republic of Germany reducing this pollutant emission. The causes for the development of pollutants in the automobile exhausts from otto engines are the chemical composition of the gasoline and the mode of combusiton. It is still widely disputed whether a change of the hydrocarbon concentration of today s gasolines would essentially influence the hydrocarbon emission but it seems to be certain that a reduction of the lead and sulfur content in the gasoline also reduces the respective emission. The difficulties of lead reduction in gasolines are outlined. Through introduction of crankcase ventilation the hydrocarbon emission could be reduced 25% and carbon monoxide the emission during idling could be reduced. Legislation requires that the warmed up engine (oil temperature 60 C) may not emit more than 4.5 vol% CO. The hydrocarbon and lead emissions are also regulated by law. Automobiles manufactured from 1971 on have 43% lower CO and a 32% lower hydrocarbon emission. But they emit 78% more oxides of nitrogen than older models, a fact which must be taken into consideration in future legislation.

47378 **APTIC NO. 69819**

Dept. of the Air Force, Washington, D. C.

UPDATED FINAL ENVIRONMENTAL STATEMENT FOR B-1 AIRCRAFT DEVELOPMENT (FINAL REPORT). *66p., Feb. 11, 1974. 35 refs.*

NTIS: EIS-AA-74-0241-F

An updated final environmental impact statement is presented for B-1 bomber aircraft. The major environmental impacts from the B-1 system are air pollution, stratospheric modification, noise pollution, and sonic boom. Emission levels from the F-101 gas turbine engine used in B-1 aircraft based on tests for standard day conditions are 0.5-100 g/kg fuel for carbon monoxide, 0.2-80 g/kg fuel for hydrocarbons, and 4.2-23.9 g/kg fuel for nitrogen oxides. The levels depend on the operating mode of the aircraft. Smoke levels are estimated to range from a smoke number of two for taxi/idle to a smoke number of 22 for maximum nonaugmented power. The potential impact of the B-1 on the stratospheric environment is expected to be negligible compared to the impact of supersonic transports for the following reasons: the B-1 will have lower emission levels; the B-1 will spend less total time in the stratosphere; and the B-1 will operate in a narrow altitude band of the stratosphere where ozone concentration is relatively low as opposed to SST operation in wide altitude bands where ozone concentrations are relatively high.

47379 **APTIC NO. 69849**

ON STATISTICAL ANALYSES OF INSPECTED OIL-FIRING SYSTEMS. *(Ueber statistische Analysen von kontrollierten Oelfeuerungen). Text in German. Gesundh. Ingr., 95(12):342-343, 1974. 2 refs.*

In the Federal Republic of Germany, inspections of oil-fired heaters revealed that presently between 40 and 60% emitted too much soot, unburned oil, or odorous substances. Burner and heater models manufactured between 1945 and 1955 produced the worst results, with 60% having emissions which were too large. This shows clearly that inadmissibly high emissions from oil-fired heaters are not only due a lack of adequate maintenance but also to wrong technical designs.

47380 **APTIC NO. 69953**

National Research Council of Canada, Associate Committee on Scientific Criteria for Environmental Quality Subcomittee on Pesticides and Related Compounds

ATMOSPHERE. AIR AND RAINWATER. *In: Chlordane: Its Effects on Canadian Ecosystems and Its Chemistry, NRCC 14094, Subcommittee Rept. 2, p. 1, 2, 41, 43-45, 54, 56, 157, 158, 161, 163, 165, 166, 168, 174, 177, 183, 184, 186, 188, 1974. 18 refs.*

Inadvertent atmospheric contamination from the pesticide chlordane make take place because of drift from aerial applications and granular formations. Dust can arise from the manufacture, transit, and application of chlordane. Wind erosion may also cause the transport of the pesticide. Soil-incorporated residues of chlordane volatilize at a rate faster than that of dieldrin. Photo-isomerization by ultraviolet light of residues within the atmosphere is also a possibility. Some studies have indicated that chlordane may move from natural waters into the atmosphere. Bottom sediments may prevent the escape of chlordane from natural water bodies into the atmosphere. The height of the water column can also influence the process. The extensive use of chlordane for structural and household pest control raised the question of aerial transport within exposures. Several experiments in buildings are described. Some chlordane residues have been found in air samples at various localities, but the possible daily respiratory intake of chlordane and other pesticide residues is only a fraction of that ingested from food.

47381 **APTIC NO. 70141**

AIR POLLUTION IN CALIFORNIA. ANNUAL REPORT 1973. *California Air Resources Board, 44p., Jan. 1974.*

The status of air pollution controls, strategies, and research planning is presented in this annual report (1973) for California. Air pollution problems are mainly due to photochemicals (smog) caused by atmospheric reactions of hydrocarbons and oxides of nitrogen in sunlight. Carbon monoxide and suspended particulate matter also cause severe pollution problems. Factors influencing polluton levels and trends are noted. An emission inventory defines the location of pollution sources and indicates the type, magnitude, and relative contribution to total air pollution in the State of the emissions from various sources. The inventory can also be used to evaluate the effectiveness of air quality control programs in reducing air pollutants. The Board coordinates the air pollution control activities of local air pollution control agencies, the State, and the Federal government in California. Local control districts have the primary responsibility for pollutant control from industry and other stationary sources, the Air Resources Board is empowered to provide assistance to the districts and to take direct enforcement action when necessary. An Air Pollution Emergency Contingency Plan is described, as well as planning and research programs, legislation, and air quality standards.

47382 **APTIC NO. 75052**

Office of Air and Water Programs, Research Triangle Park, N. C., Emission Measurement Branch

KANSAS CITY TERMINAL ELEVATOR, KANSAS CITY, MISSOURI. *EMB Proj. 74-GRN-6, Emission Testing Rept., 26p., May 1974.*

Particulate emissions were measured at the railroad loading and grain cleaning baghouse collectors of the Kansas City Terminal Elevator Co., Kansas City, Mo. The stack gas and particulate emission data for the loading tests are tabulated. For three tests particulate emissions averaged .54 lb/hr. The particulate collected in the impingers amounted to an average of 35% of the total particulate collected for the three tests. One test was conducted at the grain cleaning site, and total particulate concentration was 0.13 lb/hr. Visible emissions of fugitive dust from the loading shed were measured in three test runs under varying conditions. The data will be used to set performance standards for grain loading operations.

1973

47383 **APTIC NO. 69422**

Brocke, W.

ENVIRONMENTAL POLLUTION BY CONVENTIONAL POWER PLANTS. AIR POLLUTION CAUSED BY CONVENTIONAL POWER PLANT EMISSIONS. *(Umweltbelastung durch konventionelle Kraftwerke. Die Luftbelastung durch Emissionen konventioneller Kraftwerke). Text in German. Strahlenschutz Forsch. Prax., vol. 12:67-76, 1973. (Presented at the Association of German Radiation Protection Physicians and the Association for Radiation and Environmental Research, 12th Conference, Munich and Neuherberg, West Germany, Oct. 8-9, 1971.)*

Data on the contribution of conventional thermal power plants to air pollution is presented. Particulate matter, sulfur dioxide, sulfur trioxide, gaseous fluorine compounds, carbon monoxide, nitric oxide, nitrogen dioxide, and gaseous organic compounds are the chief pollutants emitted by combustion equipment firing fossil fuel. Assuming that no improved emission control measures relative to the current practice will be implemented, the particulate emission is expected to increase by 13% in the 1970- 1980 period in West Germany, and increase by 22% for sulfur oxides, 18% for fluorine compounds, 34% for nitrogen oxides, 35% for CO, and 13% for organic compounds. Stationary combustion equipment is responsible for some 88% of the total SO2 emission in West Germany and power plants are responsible for 70% of all fluorine emissions. The CO and organic emissions by power plants are not significant relative to those generated by automobiles and other industries. The specific pollutant emission is highest for soft coal-fired power plants.

47384 **APTIC NO. 69503**

Calvin, Melvin, Gordon Steel, and W. Glenn Howells

CHEMICAL CHARACTERIZATION OF AUTOMOBILE FUELS AND EXHAUST EMISSIONS AND EXAMINATION OF THE COMPOSITIONAL CHANGES IN EXHAUST INTRODUCED BY FUEL AND ENGINE DESIGN VARIATIONS (FINAL REPORT). *California Univ., Berkeley, California Air Resources Board Contract PCA-133, Proj. ARB-5-066-1, Rept. ARB-R-PCA-133-07, Terminal Rept. of Project Clean Air 133, 40p., March 1973. 16 refs.*

NTIS: PB 23132

The hydrocarbons in three modern gasolines and in the exhaust products produced by burning one of the fuels in a laboratory engine were analyzed using gas chromatography-mass spectroscopy techniques. The gasolines were mixtures of straight-chain, branched chain, and cyclic aliphatic hydrocarbons, mono- and bi-cyclic aromatics, and, at lower concentrations, aliphatic olefins. The carbon number distribution was predominantly between C3 and C12. High concentrations of aromatic hydrocarbons were present in all of the gasolines examined. Several approaches were used to analyze exhaust gases. The method which was technically most straightforward involved bubbling exhaust through cyclohexane. Material so obtained was rich in the higher molecular weight (almost exclusively aromatic) components of gasoline exhaust. This portion of exhaust contained polycyclic aromatics which are of significant toxicological importance. The cyclohexane trapping procedure seems to offer great potential for obtaining large samples sufficient for chemical characterization and toxicity studies. (Author summary modified)

47385 **APTIC NO. 69615**

Christiansson, A. G., F. H. Rainwater, M. A. Shirazi, and B. A. Tichenor

WET COOLING TOWERS. *In: Reviewing Environmental Impact Statements - Power Plant Cooling Systems, Engineering Aspects. Environmental Protection Agency, Corvallis, Oreg., Pacific Northwest Environmental Research Lab., Program Elements 1BAO32 and 1BB392, Rept. EPA-660/2-73-016, p. 21-34, Oct. 1973. 30 refs.*

GPO

Important factors for review in evaluating the environmental impact of cooling towers are discussed, with particular emphasis on the possibility of fogging or icing conditions caused by cooling tower plumes. Under adverse climatic conditions (i.e., high humidity, low temperature, and inversion) the moisture of the plume can produce a fog condition. Natural draft towers are less likely to cause fogging problems than mechanical draft towers in most cases. Analytical techniques for evaluating the fog potential of cooling tower plumes include: estimation of the concentration of liquid water added by the cooling tower plume to the ambient atmosphere in the vicinity of the cooling tower, approximating the dilution of a cooling tower plume by the ambient atmosphere using the standard methods of evaluating smoke plumes from a point source, mathematical modeling of cooling tower plumes, and prediction based on empirical observations form existing towers correlated with meteorological information. The possible interaction between cooling tower plumes and nearby point sources of air pollution from industrial plants must be considered. Geographical areas of high, moderate, and low potential for adverse cooling tower effects are illustrated on a map of the continental United States.

47386 **APTIC NO. 69910**

Craxford, S. R.

AIR AND WATER POLLUTION IN THE UNITED KINGDOM. *Build. Serv. Engr., vol. 41:153-158, Oct. 1973.*

The problems of air and water pollution in the United Kingdom are discussed. The worst grit and dust sources are boilers, furnaces, and handling of materials such as coal or coke in the open. The Clean Air Act of 1959 requires industry to take the best practicable means to prevent the emssion of grit and dust, and standards have been set for various types of plants. Since grit and dust have not decreased since 1958, the sources of dust must be further studied. Smoke concentrations have decreased. The Clean Air Act has also resulted in a reduction in smog and sulfur dioxide. Although SO2 concentrations in London are as high as ever, bronchial patients are hardly affected by them. Smoke concentrations are higher in northern parts of the United Kingdom because of the more frequent use of coal. Because of the reduction of smoke, other pollutants such as odors which were previously tolerated or were unnoticed are now major problems. Regulations have also been passed to limit pollution from diesel and gasoline vehicles.

47387 **APTIC NO. 56507**

Endo, Kenichiro

ON THE ENVIRONMENTAL ADMINISTRATIVE ACTIVITY OF OUR MILL. *(Jujo Seishi Kushiro kojo no kankyo kanri ni tsuite). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Contr.), 26(84):29-30, Jan. 1973.*

The heavy oil burning boilers and a bark and heavy oil burning boiler produce 350-400 tons/hr of steam for thermal power generation in a paper manufacturing plant. Exhausts are discharged through a stack after dust is removed by multicyclones. Sulfur oxides are discharged at a K value of 11.86-13.95, below the allowed K value of 22.2. The dust discharged is less than 0.1 g/N cu m from oil burners and 0.3 g/N cu m from bark and heavy oil burners. Odors are not as bad as normal paper manufacturing odors. Costs are cited.

47388 **APTIC NO. 67102**

Fitchen, William

PROFILE OF AIR POLLUTION CONTROL - 1972. *Orange County Air Pollution Control District, Anaheim, Calif., 14p., May 1973.*

The 1972 emission inventory for Orange County, California, is presented. An average of 4731 tons/day of all pollutants was determined. Motor vehicle pollution comprised 98% of the uncontrolled emissions in the county. The greatest part of this was carbon monoxide, which does not significantly contribute to photochemical smog. The primary contaminants responsible for the formation of photochemical smog are organic compounds and oxides of nitrogen. The large increase shown for vehicle emissions was due to a change in the measurement method required by the Environmental Protection Agency. A conversion was made from the seven-mode cycle to the constant volume system. For purposes of comparison with previous years, emissions measured by the seven-mode cycle are shown in parenthesis for motor vehicles. The inventory lists hydrocarbons, particulates, NOx, CO, and sulfur oxides produced by various sources in Orange County. Stationary sources include: petroleum production, refining, and marketing; organic solvent users such as surface coating, dry cleaning, and degreasing; chemical plants such as petrochemical, sulfur, sulfuric acid, and pulp and paper plants; metallurgical plants; mineral processing plants including glass, asphalt, cement, and concrete plants; open burning and incineration; combustion of fuels in power plants, industry, and domestic and commercial locations; and agricultural sources such as debris burning, orchard heaters, and agricultural processing plants. Mobile sources include: gasoline exhaust, gasoline blowby, gasoline evaporation, diesel-powered motor vehicles, jet and piston aircraft, ships, and railroads. Air quality standards are compared with actual air quality in various areas of the county, and historical comparisons are presented.

47389 **APTIC NO. 69603**

Goodrich, John C.

HACKENSACK MEADOWLANDS AIR POLLUTION STUDY - EMISSION PROJECTION METHODOLOGY. *Environmental Research and Technology, Inc., Lexington, Mass., Office of Air and Waste Management Contract EHSD 71-39, Rept. EPA-450/3-74-056-b, 277p., Oct. 1973. 36 refs.*

NTIS: PB 238608/AS

Emission projection methodology and its application to the evaluation of four alternative land use plans for the New Jersey Hackensack Meadowlands for 1990 are outlined. The methodology developed is used in conjunction with an Air Quality for Urban and Industrial Planning (AQUIP) computerized model to permit the computation of air quality in relation to specific land use activities. Pollutants investigated in the evaluation study include: total suspended particulates, sulfur dioxide, carbon monoxide, hydrocarbons, and nitrogen oxides. Topics covered include: planning activity data, requirements of the AQUIP system and a dispersion model which influence the structure of the emission inventories, the role of regulations and control technology in the study, the actual development of the emission projection methodology, various assumptions and constraints emissions catalog specifications, background and current emissions inventories, and inventories for the 1990 land use plans. Point, area, and line sources are covered and include industrial, non-industrial, and transportation sources of emissions.

47390 **APTIC NO. 67104**

Gronhovd, G. H., P. H. Tufte, and S. J. Selle

SOME STUDIES ON STACK EMISSIONS FROM LIGNITE-FIRED POWER PLANTS. *Preprint, 28p., 1973. 6 refs. (Presented at the Lignite Symposium, Grand Forks, N. Dak., May 9-10, 1973.)*

Tests were conducted at three pulverized coal-fired power plants, one cyclone-fired plant, and one spreader-stoker-fired plant, each burning lignite from a different mine to study the quantity and quality of stack emissions from boilers burning North Dakota lignite. The 1.2 lb/MM Btu sulfur dioxide emission limit was exceeded on 33 of the 46 test days, although a 40% reduction would have resulted in emissions under the limit. Significant amounts of sulfur were retained by the ash in most of the tests, with most of the results being between 10 and 40%. There were some indications that the retention was less with cyclone firing than with pulverized coal firing. The SO2 emission was strongly influenced by the sodium content of the coal; increasing the Na from 0.9 to 6.1% in the ash reduced the SO2 from 800 to 590 ppm. Boiler load did not greatly influence SO2 emissions. Nitrogen oxide emissions were greater for cyclone-fired than for pulverized coal-fired units, and the fly ash particle size at the boiler outlet when burning low-Na lignite was also considerably greater for cyclone-firing units. Correlations developed in laboratory tests predicted that increasing the Na content of the ash from 0.9-6.1% would reduce resistivity by a factor of 100 in field tests.

47391 **APTIC NO. 69533**

Hare, Charles T., Karl J. Springer, William Rogers Oliver, and William H. Houtman

SMALL ENGINE EMISSIONS AND THEIR IMPACT. *Preprint, Society of Automotive Engineers, Inc., New York, 27p., 1973. 20 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730859.)*

In an attempt to characterize emissions from small air-cooled utility engines, five gasoline-fueled models were operated over a variety of speeds and loads, and important exhaust constituents were measured. These emissions included hydrocarbons, nitric oxide, carbon monoxide, carbon dioxide, oxygen, aldehydes, light hydrocarbons, particulates, and smoke. Emissions of sulfur oxides were estimated on the basis of the fuel consumed; evaporative losses of HC were also estimated. The impact of small engine emissions was calculated on the basis of the test results and information on national engine populations and usage. The 50 million or more small engines currently being used account for only a small part of the pollution from all sources. As percentages of the 1970 totals from all sources, small engines appear to nationally account for approximately 0.4% of HC, 0.8% of CO, 0.06% of nitrogen oxides, 0.004% of SOx, and 0.01% of particulates. As percentages of 1970 mobile source emissions, small engines are responsible for about 0.7% of HC, 1.0% of CO, 0.1% of NOx, 0.2% of SOx, and 0.5% of particulates. About 6% of the small engine emissions occur in the northern region, 52% in the central region, and 42% in the southern region. The emission factors for small engines under different load conditions and for different engine applications such as lawn and garden work are discussed. (Author abstract modified)

47392 **APTIC NO. 69827**

Junker, Hans-Joachim

FUEL INJECTION IN FURNACES AND ITS EFFECTS ON SULFUR DIOXIDE EMISSION IN THE FEDERAL REPUBLIC AND WEST BERLIN IN 1971. *(Brennstoffeinsatz in Feuerungsanlagen und seine Auswirkungen auf die Schwefeldioxid-Immission in der Bundesrepublik und Westberlin im Jahre 71). Text in German. Braunkohle, 25(7-8):229-231, 1973. 5 refs.*

The evolution of the sulfur dioxide emissions in industry, power plants, domestic heating equipment, and motor vehicles in West Germany and West Berlin during the last years is outlined, and data on the sulfur content in the available fuels is presented. During the 1967-1971 period, the absolute SO2 emission increased by only 3.3%, while the fuel consumption increased by 25%. The domestic heating area experienced a drop by 12.8% in the SO2 emissions despite a 19% increase in the fuel consumption. Both the soft coals and briquettes used in Germany are characterized by rather low sulfur content ranging from 0.3 to 3% for soft coal, and averaging about 0.4% in briquettes, respectively. The percentage of sulfur retained by the ash ranges from 35 to over 70%. The fuel oil commercially available has an average sulfur content of 0.42%, but an increase in this percentage is expected in view of the limited supply of low-sulfur crude oil. The contribution by automobiles to the SO2 emissions amounts to about 3%.

47393 APTIC NO. 69366

Kuentzmann, P.

EXPERIMENTAL STUDY OF THE CONDENSED PHASE IN THE COMBUSTION PRODUCTS OF METALLIZED SOLID PROPELLANTS. *Rech. Aerosp., no. 2:71-80, March-April 1973. 11 refs. Translated from German. Air Force Systems Command, Wright-Patterson AFB, Ohio, Translation Div., FTD-HC-23-2714-74, 30p., Sept. 11, 1974.*

NTIS, DDC: AD 785996

The formation processes and the evolution of metallic oxide particles in combustion products of a metallized propellant are reviewed. The various techniques for experimentally determining their granulometry are then presented including direct and indirect techniques. Their characteristics and limits are discussed. These techniques were used to experimentally study the condensed phase in the combustion products of metallized solid propellants. The results emphasized the great dispersions which do not permit the definition of the influence of the engine flunctioning parameters on granulometry other than in a qualitative manner.

47394 APTIC NO. 67362

Matson, Robert E., John W. Blumer, and Laurence A. Wegelin

QUALITY AND RESERVES OF STRIPPABLE COAL, SELECTED DEPOSITS, SOUTHEASTERN MONTANA. *Montana State Bureau of Mines and Geology, Butte, Bull. 91, Environmental Protection Agency Contract 5800 900, Rept. EPA-450/3/74-033, 145p., Dec. 1973. 66 refs.*

NTIS: PB 232522/AS

Quality and quantity of strippable subbituminous and lignite coal in 32 deposits in southeastern Montana are described. Coal distribution is illustrated on 46 separate plates. All of the coal is classified as low in sulfur except Sweeney Creek-Snyder Creek coal deposit. Its reported S content exceeds 1% in four core samples. Total strippable reserves are 32 billion tons on 770,000 acres. Proximate analyses, forms of S, colorific values, and major ash constituents of the coal samples are tabulated. (Author abstract modified)

47395 APTIC NO. 69667

Page, A. L. and F. T. Bingham

CADMIUM RESIDUES IN THE ENVIRONMENT. *Residue Rev., vol. 48:1-44, 1973. 79 refs.*

Residues of cadmium in the environment are of particular concern becasue of known toxicities of it and its compounds to human beings and animals. Cadmium is absorbed through the respiratory system and the gastrointestinal tract. Chronic exposure can result in accumulations which cause serious health problems and even death. Cadmium is a minor constituent of the earth s crust and has a mean concentration of 15 ppm. It occurs in the greatest amounts in zinc areas. It also occurs in fossil fuels. Normally, Cd concentrations are less than 1 ppm in soils, on the order of a few ppm in vegetation, and less than 0.001 micrograms/cu m in the air. Cadmium is a by-product of metal refining. It is used in a wide variety of consumer goods; practically all of the cadmium consumed is used in electroplating, pigments, and chemicals. The concentrations of Cd in surface soils in very close proximity to industries which process ores containing Cd are unusually high (10-100 ppm). Cadmium which is deposited onto soil from industrial stack emissions is apprarently quite immobile and remains concentrated in the surface soil. Roadside surface soils are cadmium-contaminated from traffic, but the extent of contamination is small compared to industrial sources. The principal source of Cd residues in surface roadside soils is tire wear; additonal possible sources are motor and lubricating oils. Urban air commonly contains more Cd than nonurban air. Annual mean concentraions of urban air are orders of magnitude less concentrated than air sampled close to certain Cd-emitting industries. Metallurgical processing and reprocessing and incineration of urban solid waste are the principal sources of ambient Cd. Vegetation may become contaminated by deposition from atmosphere sources or by plant abosrption from contaminated soils. More information is needed on the cycling of Cd in the environment and on the toxic effects of long-term low levels of exposure. (Author summary modified)

47396 APTIC NO. 75030

Plassman, Bresser, Weyrauther, and Kiefer

STUDY OF ENVIRONMENTAL IMPACT AND ENVIRONMENTAL DAMAGE FROM CITY TRAFFIC - NOISE AND EXHAUST GASES PART II, 1.1: ANALYSIS OF THE RELATIONS BETWEEN GROWTH IN TRAFFIC, COMPOSITION OF TRAFFIC AND EXTENT OF GAS LOADING. PART II, 1.2: STUDY OF THE COSTS OF CHANGES TO THE VEHICLE FOR REDUCTION OF EXHAUST GAS EMISSIONS. *Technological Monitoring Society of the Rhineland, Cologne (West Germany), Dept. of Applied Thermodynamics and Energy Technology, Ministry of Commerce Contract, Feb. 1973. 15 refs. Translated from German, 203p.*

The relationship between traffic, traffic composition, and the extent of exhaust gas toxicity was determined based on surveys of the air quality in Cologne. Emission measurements were performed in selected streets in Cologne, and the emission load of these streets was determined. Using a computer analysis, the relationship between vehicular emissions and air quality was determined, taking wind conditions into consideration. The selected streets were then arranged in city model building blocks in order to make possible a transfer of the relation between vehicular emissions and ground level concentrations to other large cities. The frequency with which the measured air quality values exceeded the medical emission limits was determined. The costs of reducing the emissions of vehicles were also determined during a survey of the auto industry. The study considers carbon monoxide, hydrocarbons, nitrogen oxides, nitrogen dioxide, and sulfur dioxide.

47397 APTIC NO. 69318

Sohn, H. Y. and J. Szekely

ON THE OXIDATION OF CYANIDES IN THE STACK REGION OF THE BLAST FURNACE. *New York State Univ., Buffalo, Steel Ind. Environ., C.C. Furnas Mem. Conf., 2nd, Buffalo, N. Y., 1971, p. 249-264, 1973. 7 refs.*

The oxidation of potassium cyanide particles carried by the blast furnace gas through the stack region is discussed. Calculations of the oxidation were performed on the assumption that the process was mass transfer controlled, but proper allowance was made for the continually varying carbon monoxide/carbon dioxide ratios and temperatures to which the particles were subjected during the passage through the stack. The assumption of mass transfer control provided a set of asymptotic solutions, which correspond to the fatest oxidation rates possible, for a given set of temperature and gaseous concentration profiles. The calculations showed that if the cyanide particles were produced within the size range 0.02-0.1 cm in diameter, then the system would be extremely sensitive to both the temperature profiles and the profiles of the CO/CO2 ratios within the stack. This finding appeared to be consistent with practical observations, which indicated that an increase in the CO/CO2 ratio resulted in an increased emission of cyanides. There may be a real possibility of reducing the net emission of cyanides from the blast furnace by the appropriate manipulation of the temperature and CO/CO2 profiles within the stack. It would be highly desirable to examine in detail the kinetics of the oxidation of KCN with a CO plus CO2 mixture, so that the hypothesis of mass transfer control may be verified. Alternatively, such a study would yield the appropriate rate expression for use in the model presented, in place of the mass transfer limited asymptote. (Author conclusions modified)

47398 **APTIC NO. 69378**

Taylor, G. W.

WINTER TESTING OF AUTOMOBILE IDLE EXHAUST EMISSIONS IN EDMONTON, ALBERTA. *Environmental Protection Service, Ottawa (Ontario), Mobile Source Div., Surveillance Rept. EPS 5-AP-73-14, 28p., Sept. 1973.*

Results of a 6-month automobile idle emissions testing program carried out by the Alberta Motor Association are given. Tests were performed on over 3500 vehicles, and emission distribution graphs were prepared from the results of 2300 of those tested. A seven car control fleet was also operated to assess any influence that cold ambient temperatures might have on idle emission concentrations. Because of fluctuations in the vehicle s state of tune and warm-up times, it was not possible to isolate any apparent effect of ambient temperature on idle emissions. The engine temperature was postulated to be the primary idle emission-related parameter, however, with ambient temperature having only nominal influence. For this reason, any vehicle inspection program should ensure that cars being tested are fully warmed up by setting minimum pre-test operating times. The results are believed to give a reliable indication of the idle concentrations of emissions from cars in Alberta; however, because the sample was not wholly representative, there may be slight biasing of the total vehicle population results towards lower emission levels. It is feasible to operate a mobile idle emission testing unit year-round without fear of inaccuracy of measurement or excessive program down time. (Author abstract)

47399 **APTIC NO. 69941**

Warda, R. D. and R. K. Buhr

SAMPLING AND CHARACTERIZATION OF CUPOLA EMISSIONS. *Dept. of Energy, Mines and Resources, Ottawa (Ontario), Physical Metallurgy Div., Rept. R 266, 56p., July 1973. 3 refs.*

Characteristics of gaseous and particulate emissions from six iron foundry cupolas are presented and correlated with certain operating practices. The sampling technique employed is also described. Variations in stack gas concentrations of oxygen, carbon monoxide, and carbon dioxide were observed between foundries and within given foundries, with the primary factor responsible for such variations being dilution by charge-door air. Concentrations of nitrogen oxides and sulfur oxides, however, did not vary with the dilution factor in a systematic manner; the possibility of significant sampling errors precluded any conclusions concerning these two emissions. Foundry-to-foundry variations in dust emission rates of almost one order of magnitude (45 lbs/ton to 4.8 lbs/ton) were observed along with significant variations within individual foundries. The largest variations in emission rate occurred for coarse fractions of dust. The dust appeared to be transmitted rather than generated by the cupola, offering the possibility of virtual elimination by changes in charging practices. Variation in emission rate with dust size was significant below 100 micron. Silica was the predominant component of all size ranges of dust. All sampling tests were conducted in the cupola stack above the charge door, with the distance between the charge door and the test cross-section varying from 2.5-6 stack diameters. The test cross-section was subdivided into either 3 or 5 equal concentric areas, and two mutually perpendicular probes were used to sample each sub-area at four locations.

47400 **APTIC NO. 65483**

Watson, H. C.

INFLUENCE OF VEHICLE DRIVING PATTERNS ON LOCALIZED URBAN EMISSIONS SOURCES. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1973. 28 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., May 14-18, 1973, Paper 730556.)*

Procedures for calculating the emissions of the population average diesel- and gasoline-fueled vehicles in a range of operating modes are presented. Emission models were developed to predict carbon monoxide, hydrocarbon, and nitrogen oxides emissions along urban roadways. With the aid of a traffic model, the influence on this emission source of variation in traffic patterns and density along prescribed routes could be assessed. The emission rates of statistically significant groups of nonemission controlled cars could be predicted to within + or - 20% of the values measured in European and American surveys. Changes in driving patterns, while maintaining a fixed average speed along a given length of road, can have a large influence on the amount of emissions produced. Traffic flow can be improved to reduce the total emissions. At low speeds, 2-5 m/sec, increasing stop-start driving can reduce the CO and hydrocarbon emissions from cars. In the central city area of Edinburgh (Scotland), the transfer of 20% of private motorists onto additional buses could reduce the CO by 20% and hydrocarbons by 15%, although NOx might be increased. (Author conclusions modified)

47401 **APTIC NO. 69971**

Watson, H. C.

INFLUENCE OF VEHICLE DRIVING PATTERNS ON LOCALIZED URBAN EMISSIONS SOURCES. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1973. 28 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730556.)*

Procedures for calculating the emissions of the population-average diesel- and gasoline-fueled vehicles in a range of operating modes are presented. These procedures, together with a simple, but flexible, model of vehicle driving patterns, are used to show how changes in traffic flow and driving patterns can influence the vehicular source of emissions along urban roadways. The procedures are applied to predict emission rates in hypothetical traffic flows and in real traffic conditions as measured in central Edinburgh, Scotland, where the relative contributions of individual traffic groups to the vehicular emission sources have been assessed. The applications of the prediction procedures described allowed the following conclusions to be drawn. The carbon monoxide, hydrocarbon, and nitrogen oxide emission rates of statistically significant groups of nonemission-controlled cars can be predicted to within about + or - 20% of the values measured in European and American surveys, over either European or American Federal driving cycles. Changes in driving patterns, while maintaining a fixed average speed along a given length of road, can have a large influence on the amount of emissions produced. Variations in the emission sources of up to 12 times their values at steady cruising speed were predicted when realistic variations in delay time and number of delays were accounted for. Traffic flow can be improved to reduce the total emissions produced by diesel- and gasoline-fueled vehicles; but the best overall reductions are not necessarily achieved when average speeds, delay time, and the number of delays are simultaneously improved. At low traffic speeds, 2-5 m/sec, increasing stop-start driving can reduce the CO and HC emissions. Emission rates predicted with allowance for the variation in driving patterns found in central Edinburgh were greater than the rates for the European pattern by factors of 1.0-3.8 for CO, 1.1-2.2 for HC, and 0.2-2.3 for NOx. In the central city area, the transfer of 20% of private motorists onto additional buses could reduce the CO emissions from motor vehicles by 20% and HC by 15%, although NOx emissions might increase slightly. (Author abstract modified)

47402 **APTIC NO. 69525**

Wientjens, W. H. J. M.

ENVIRONMENT AND THE QUALITY OF LIFE. MERCURY, CADMIUM, AND CHROMIUM IN THE NETHERLANDS. *(Environnement et qualite de la vie. Le mercure, le cadmium et le chrome aux Pays-Bas). Text in French. TNO, Delft (Netherlands), Central Lab., Rept. 2, Commission of the European Communities Rept. Eur 5006 f, 28p., Sept. 1973. 47 refs.*

Statistical data on the quantities of mercury, cadmium, and chromium used or generated in the Netherlands are presented; and real and potential contamination of the ecosystems by these metals are discussed. While the environmental hazards of mercury are mainly due to water contamination and residues in food, especially in fish, mercury is also released into the atmosphere during the combustion of coal, petroleum products, and natural gas. Cadmium is emitted into the atmosphere by zinc smelters and facilities incinerating coal, petroleum products, wood, paper, and organic wastes.

47403 **APTIC NO. 69602**

Willis, Byron H.

HACKENSACK MEADOWLANDS AIR POLLUTION STUDY - SUMMARY REPORT (FINAL REPORT). *Environmental Research and Technology, Inc., Lexington, Mass., Office of Air and Waste Management Contract EHSD 71-39, ERT Proj. P-244-SR, Rept. EPA-450/3-74-056-a, 118p., July 1973. 7 refs.*

NTIS: PB 238607/AS

Procedures developed for the application of an Air Quality in Urban and Industrial Planning (AQUIP) computerized model to the evaluation of four land use plans (1990) for the New Jersey Hackensack Meadowlands District are discussed in a summary report. The assessment fo air quality was restricted to the consideration of regional scale concentrations of pollutants for annual averages for summer and winter seasonal averages. Five pollutants were considered: total suspended particulates, sulfur dioxide, carbon monoxide, total hydrocarbons, and nitrogen oxides. The analysis also included the influence of emission sources outside the Meadowlands on air quality within the planning region. The study was restricted to the use of available emissions data and air quality measurements data for model validation. Analytical methodologies were developed for: estimating total future (1990) air pollution emissions for an urbanized area, translating projected emissions into predictions of future air quality levels, and the evaluation and ranking of alternative urban plans.

47404 **APTIC NO. 69353**

Wilson, H. H. and L. D. Johnson

CHARACTERIZATION OF AIR POLLUTANTS EMITTED FROM BRICK PLANT KILNS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Particulate and Chemical Processes Branch, 15p., 1973 (?). 15 refs.*

Stack gases analyses and emission factors were obtained for four brick plants selected as extreme cases of pollutant emitters. Each of the four plants used tunnel kilns fired with natural gas. Average stack gas concentrations for the four plants ranged from 32.0-359 mg/cu m for nitrogen oxides, 121-2690 mg/cu m for sulfur dioxide, 17.9-71.8 mg/cu m for sulfur trioxide, 31.7-162 mg/cu m for fluorides, 2.1-13 mg/cu m for chlorine, and 8-56 mg/cu m for particulates. Chemical analyses of plume particulates presenting visible emissions (opacities as high as 15%) identified the particulate emissions as mixtures of ammonium bisulfate and ammonium sulfate. Emission factors for the four plants ranged from 157-2668 mg/kg brick for sulfur dioxide, 22.5-99.4 mg/kg for sulfur trioxide, 79.9-549 mg/kg for fluorides, and 113-501 mg/kg for chlorine. These factors were computed from chemical analyses of raw and fired materials rather than from the stack analyses and production rates.

47405 **APTIC NO. 65378**

Chinese Bureau of Medical Science

QUANTITATIVE STUDY OF MAJOR POLLUTANTS EMITTED FROM DIESEL ENGINES. *(Tsai yu ji huei chi tzong ji yau yu hai nu ji te han lian). Text in Chinese. Chin. Med. J., no. 1:57-59, 1973.*

The concentrations of pollutants emitted from various diesel engines of different horse powers at different running conditions were measured. Nitrogen oxides and aldehydes were analyzed by colorimetric method, carbon monoxide by high speed measuring tubes, and hydrocarbons by the gas phase spectrophotographic method. Exhaust gases were sampled at about 100 deg at the center of the gas stream in the exhaust pipes. A 40 hp diesel engine emitted up to 760 mg/cu m of NOx and 630 mg/cu m of CO, whereas an 80 hp engine emitted up to 1900 mg/cu m of NOx at high speed and loading. A 2000 hp engine emitted 2000 to 3444 mg/cu m of NOx, but relatively little CO and aldehydes. New engines and well-maintained engines emitted less pollutants than used and poorly-maintained engines.

47406 **APTIC NO. 65706**

REPORT AND CONCLUSION OF THE MIXED GROUP ON AIR POLLUTION DUE TO COMBUSTION IN STATIONARY EQUIPMENT. *(Rapport et conclusions du groupe mixte sur la pollution atmospherique resultant de l emploi des combustibles dan les installations fixes). Text in French. Ann. Mines Belg., (12):1413-1432, Dec. 1973.*

Air pollution problems in Europe, Japan, and the United States generated by combustion in stationary equipment; type of combustion fuels; noxious pollutants; quantities of pollutants emitted to the air; and a strategy of protecting the environment from air pollution for the period between 1968 and 1980 are discussed. The consumption of liquid combustibles in Europe will increase from 279,000,000 tons to 671,000,000 in 1980; the estmiated figure for North America is 318,000,000 as compared to 189,000,000 in 1968; and, for Japan, from 69,000,000 tons in 1968 to 272,000,000 in 1980. In 1980, the consumption of liquid fuels will represent 80% as compared to 20% of solid and gaseous combustibles. In North America, coal and natural gas will represent 83% of the total combustibles used in 1980, coal representing 29% and gas 54% of the total. The main source (60%) of sulfur oxide emissions in Europe and Japan are liquid combustibles, and will reach 76% in 1980. In North America,, the present percentage of 20% for liquid fuels will not change. The sulfur oxide emissions will increase from 16,700,000 tons in 1968 to an estimated 27,400,000 tons in 1980. The corresponding figures for North America are: from 26,600,000 to 53,000,000 tons; and, for Japan from 4,000,000 to 14,000,000 tons; increasing, respectively, by 63, 100, and 250% in 1980. The figures for nitric oxide indicate an estimated increase of emissions for Europe, Japan, and North America, of, respectively: from 4,500,000 to 7,100,000 tons; from 1,000,000 to 3,400,000 tons; and, from 9,300,000 to 16,600,000 tons from 1968 to 1980. The main source of particles emitted to the air is the combustion of solid fuels. The solutions proposed are: development of new procedures of exhaust disposal, desulfurization, washing of coal and utilization of fuels with low sulfur content. Other solutions provide for improved burning techniques. Methods of reduction and dispersion of emissions, disposal of wastes, management of fuels, and problems of energy management are discussed. Also utilization of nuclear energy should be promoted. The high costs of pollution control can be met by big industrial units, but are too high for the small homeowners and commercial units.

47407 **APTIC NO. 69251**

Waseda University (Japan) Physics and Engineering Research Labs.

A SURVEY OF AIR POLLUTANT EMISSION COEFFICIENT CALCULATIONS. (FIXED EMISSION SOURCES). COLLECTION OF REPORT DATA. *(Taiki osen buttshitsu haishutsu keisu sanshutsu chosa (kotei hasseigen) hokokusho detashu). Text in Japanese. 149p., June 1973.*

Measurements of pollutant concentrations and calculations of their emission coefficients were conducted on several major pollutants including sulfur dioxide, nitrogen dioxide, particulates, carbon monoxide, hydrocarbons and aldehydes. To calculate emission coefficients, mass balance is desirable since it gives a more accurate total emission. Measurement of the composition of combustion gas is necessary in order to carry out mass balance. For facilities using electricity as the heating source, the total flow rate in the ducts, as well as electricity consumption and quantity of feed material, were measured to obtain the absolute quantity of pollutant. Sulfur oxides were measured by infrared spectrometry and the neutralization method; NOx by potentiometry, chemiluminescence or coulometric method; particulates by the filter paper method; CO by gas chromatography with thermal conductivity or flame ionization detectors, HC by gas chromatography-flame ionization detector; and RCHO by the 3-methyl-2-benzothiazolone hydrazone method. Emission coefficients were calculated for the following cases: facilities using fuel and having less than 19% oxygen in the combustion gas, facilities using fuel and having more than 19% O2 in the combustion gas, and facilities without using such fuel.

47408 **APTIC NO. 69420**

Committee on Human Environment (Pakistan)

HUMAN ENVIRONMENT IN PAKISTAN. PROBLEMS, PROSPECTS, AND PROPOSALS. *66p., April 1973.*

Long-term and short-term environmental problems are identified in a report by Pakistan s Committee on Human Environment. Topics covered include: human settlements, water supply and sanitation, industrial pollution, natural resources and energy development, water resources management, agriculture and forestry, marine environment and fishery resources, wildlife, medicine and public health, education and information, and institutional arrangement. Although the magnitude of environmental pollution in Pakistan has not been fully assessed, the following air pollutants and their associated industrial and nonindustrial sources are selected for further study: carbon monoxide, sulfur dioxide, particulates, mercury, lead, nitrates, nitrites, chlorinated hydrocarbons (including pesticides), polychlorinated biphenyls, pathogenic microorganisms, and ionizing radiation. Recommendations of the Committee are set forth along with a declaration of principles.

1972

47409 **APTIC NO. 66773**

Cleaver, Thomas G.

POLLUTION AND THE POWER INDUSTRY. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 345-359. 27 refs. (April 20-21.)*

The production of electric power and the pollutants that arise from this power generation are discussed. Air pollution from electric power generation is responsible for about 12 1/2% of the total air pollution. Fly ash and soot produced from the burning of coal are unsightly, but are not believed to be particularly dangerous to health. Sulfur dioxide is much more insidious than fly ash because it is a colorless gas. When it is oxidized to sulfur trioxide and mixed with water (such as in the lung) it forms sulfuric acid. Nitrogen oxides help form photochemical smog. The NOx are formed in the furnace of a power plant at high temperatures in the presence of the nitrogen and oxygen found in air. The O2 could be reduced to reduce the NOx, but this would cause inefficient combustion of the coal and would result in excessive release of carbon monoxide. Nuclear power plants do not cause air pollution in the usual sense, but they do emit small quantities of radioactive gases. From an environmental standpoint, nuclear power generation is more desirable than fossil fuel power generation.

47410 **APTIC NO. 69416**

Farthouat, B. and G. O. S. Schreiber

SMALL AND LARGE ION CONCENTRATIONS IN OUTDOOR AIR AND INDOORS. EFFECT OF CIGARETTE SMOKE AND CERTAIN ION GENERATORS ON INDOOR ION CONCENTRATIONS. *Biometeorology, 5(1):49-50, 1972.*

Small and large ion concentrations varied throughout the day indoors and outdoors. A small ion maximum and a large ion minimum occurred at about 0400; and a small ion minimum and a large ion maximum occurred at about 1900. During daylight, a secondary maximum and minimum, variable in time and intensity, occurred in outdoor air. The 24-hour average ion concentrations in ion/cu cm were 195 small positive ions, 167 small negative ions and 6200 large ions. A single cigarette, smoked in a large room (150 cu m) reduced small ion concentrations to about 1/3 the original value and doubled large ion concentrations. Successive cigarettes caused smaller variations as the degree of pollution increased. A radioactive source produced only ions with mobilities exceeding 1.0 sq cm/v/sec. A flame produced equal quantities of negative and positive ions, almost all of them with mobilities ranging from 0.01 to 1.0 sq cm/v/sec. Little variation in concentration occurred, in a large room, with variations in distance between the measuring apparatus and ion source. A hot wire produced ions with mobilities of 0.01-1.0 sq cm/v/sec, but negative ions were produced in appreciable quantities only if the wire was very strongly heated.

47411 **APTIC NO. 69795**

Fish, R. A.

METALS IN THE ATMOSPHERE. *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-19, Part 2, p. 24-39, 1972. 21 refs. (Presented at the National Society for Clean Air Annual Conference, 39th, Scarborough, England. Oct. 16-20, 1972.)*

The presence of metals in the atmosphere is reviewed. General sources of metals include emissions from industrial processes, burning of fuel, and burning of rubbish. The Alkali Inspectorate has declared emission limits on metals from various industrial processes. The following specific metals are discussed: iron, zinc, arsenic, manganese, chromium, nickel, beryllium, selenium, vanadium, mercury, cadmium, and lead. Their sources, toxicity, and values in the air of North American and British cities are reviewed. A discussion of the paper is presented.

47412 **APTIC NO. 69658**

Irani, M. C., E. D. Thimons, T. G. Bobick, Maurice Deul, and M. G. Zabetakis

METHANE EMISSIONS FROM U. S. COAL MINES, A SURVEY. *Bureau of Mines Information Circ., no. 8558, 61p., 1972. 4 refs.*

The magnitude of the methane emission and control problem in the United States bituminous coal mines were determined. The emission rate for any given coalbed depends primarily on the coal production rate and mine depth, as well as on the nature of the coalbed and the surrounding strata. There was an excellent correlation between the methane emission rate and the product of coal production rate and mine depth for the mines in the Pittsburgh, Pocahontas no. 3 and 4, and the Illinois no. 5 and 6 coalbeds. The highest total emission rates found in United States bituminous coal mines in million cubic ft/day are Monongalia County, W. Va., 39; Marion County, W. Va., 30.4; McDowell Conty, W. Va., 13.1; Washington County, Pa., 11.9; Greene County, Pa., 11.4; Buchanan County, Va., 21.6; Jefferson County, Ala., 10.3; and Franklin County, Ill., 6.6. (Author abstract modified)

47413 **APTIC NO. 70183**

Nelson, L. B.

CONTRIBUTION OF FERTILIZERS TO THE ECONOMY AND THE ENVIRONMENT. *Phosphorus Agr., no. 60:15-18, Dec. 1972. 8 refs. (Presented at the ISMA, Annual Conference, Deuville, France, May 31, 1972.)*

The effects of restricted fertilizer use on the economy and environment are discussed. Abondoning or greatly restricting the use of nitrogen on major United States crops would substantially reduce crop yield and double crop prices. There would be a sharp reduction in farm exports. Because there is a lack of scientific evidence of appreciable pollution from fertilizers, restrictions are doubtful.

47414 **APTIC NO. 69799**

Peakin, F. H.

ODOUR NUISANCES IN AGRICULTURE. *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-12, Part 2, p. 57-70, 1972. (Presented at the National Society for Clean Air Annual Conference 39th, Scarborough, England. Oct. 16-20, 1972.)*

Odors from agriculture are genuine problems. The main sources of odors are pig farms and units, poultry houses, veal houses, manure driers, silage, cattle husbandry, lagoons, and food and crop wastes. The English laws regarding odors, the roles of physics, pyschology, and chemistry in odor nuisances, the broad chemical character of odors from agriculture, and methods to control odors are discussed. The transmission, perception, and measurement of odors are also reviewed. Processes for separating odorants from air include gas/liquid absorption, gas/solid adsorption, active carbon, catalysts, soil, and drugs. A discussion of the paper is given.

47415 **APTIC NO. 69797**

Whiteley, Frank

THE CHEMICAL INDUSTRY AND AIR POLLUTION. *Preprint, National Society for Clean Air, Brighton (England), part 1, p. 1-6, Part 2, p. 40-56, 1972. (Presented at the National Society for Clean Air Annual Conference, 39th, Scarborough, England, Oct. 16-20, 1972.)*

Pollution from the chemical industry is reviewed. The manufacture of ammonia has always been a major activity of the chemical industry, and process changes in ammonia s manufacture have effected the amount of atmospheric pollution. The production of nitric acid and sulfuric acid are also important in the fertilizer industry, and these processes can also cause pollution. Pollution near the Billingham Site of Imperial Chemical Industries is described which comes from ammonia, sulfuric acid, and nitric acid plants. Methods of improving air quality by the best practicable means of control are reviewed. A discussion of the paper is included.

47416 **APTIC NO. 67133**

Stanford Research Inst., Menlo Park, Calif.

PATTERNS OF ENERGY CONSUMPTION IN THE UNITED STATES. *229p., Jan. 1972. 62 refs.*

GPO

Trends in energy consumption by the residential, commercial, industrial, and transportation sectors are presented for the period 1960-1968. Growth rates vary from a low of 3.9% per year for the largest sector (industrial) to a high of 5.4% per year for the smallest sector (commercial), with industrial use remaining dominant at over 40% of the nation s total consumption. Transportation is growing almost as rapidly as the total and continues to account for about 1/4 of the total energy consumption. Residential consumption is increasing at 4.8% per year, above the overall average, and accounts for almost 20% of the total. Data are provided for the Btu consumption in each discrete application, the percent of total consumption accounted for by each application, and the growth rate between 1960 and 1968. Industrial groups individually examined include: primary metals; the chemical industry; petroleum refining; the pulp and paper industry; processes involving stone, clay, glass, and concrete products; and the food and kindred products industry.

47417 **APTIC NO. 69980**

United Engineers and Constructors, Inc., Philadelphia, Pa.

CENTRAL STATION POWER PLANTS (1000-MWE) INVESTMENT COST STUDY VOLUME IV OIL-FIRED FOSSIL PLANT. *Atmoic Energy Commission Contract AT (30-1)-3032, WASH-1230 (Vol. IV), 123p., June 1972. 1 ref.*

GPO

An investment cost study of a 1000 MWe nominally rated oil-fired fossil plant is presented. The site and environmental data were identified that form a basis of the criteria for designing the facility and for evaluating the ambient air quality concentrations that result from the emissions of a single point source. The data are topography and general site characteristics; site access; population density and land use; cooling water and public utility services; meteorology and climatology including previling wind, atmospheric diffusion properties, severe meteorological phenomena, and ambient background concentrations; air quality estimation and point model; geology and seismology; and sewage. The boiler plant equipment includes two double compartment electrostatic precipitators each to handle 2,000,000 cfm at 700 F with an efficiency of 90%. The collecting electrodes have a total effective plate area of 300,000 sq ft. There are 6900 electrodes per precipitator. The purchase cost for the precipitators is $3,500,000. Erection and gunite lining costs are $875,000.

47418 **APTIC NO. 69993**

Environmental Protection Agency, Chicago, Ill., Pesticides Technical Committee

REPORT OF THE PESTICIDES TECHNICAL COMMITTEE TO THE LAKE MICHIGAN ENFORCEMENT CONFERENCE ON SELECTED TRACE METALS. *102p., Sept. 1972. 57 refs.*

NTIS: PB 220361

Information is summarized on selected trace metals in the water, sediments, and aquatic life resources of Lake Michigan and its tributaries. The sources of these metals include industries, municipal sewage treatment plants, and atmospheric fallout. Cadmium, chromium, lead, nickel, zinc, and other metals are discussed. While data are available on water concentrations of heavy metals in Lake Michigan and its tributaries, levels of sensitivity and number and frequency of samples are inadequate to establish present conditions. Airborne emissions from power plants steel mills,and incinerators may be contributing significant amounts of some metals to the lake environment. Heavy metals usually are found in sediments at much higher concentrations than in the overlying water, but information is lacking as to the ecological significance of these accumulations in varied environments. Estimates of probable safe ranges for Lake Michigan fish are given for Cu, Ni, Zn, Cd, and Cr. General recommendations are made regarding future monitoring efforts, analytical methodology, and research needs. Except for mercury, metal residues in fish do not exceed concentrations that are likely to be selected as water quality standards. (Author abstract modified)

1971

47419 **APTIC NO. 67124**

Istock, Conrad, Jacqueline Easby, William Cooper, Harold E. Goeller, John A. Kadlec, Monte Lloyd, Gordon Mott, William W. Murdoch, Fred H. Tschirley, Robert I. Van Hook, and Mark Westoby

ECOSYSTEMS FOR HUMAN BENEFIT. *In: Man in the Living Environment. Report of the Workshop on Global Ecological Problems. Inst. of Ecology and Wisconsin Univ., p. 92-163. 128 refs.*

The prospects and problems in the management of ecological systems including self-maintaining natural ecosystems, natural ecosystems with high nutrient flow, and strongly driven systems of modern agriculture are discussed. The relationship between diversity and stability of an ecosystem and between diversity, stability, and pest control are reviewed. The effects of various toxic substances in ecosystems are described including pesticides, lead, mercury, cadmium, polychlorinated biphenyls, arsenic, nickel, beryllium, and ozone.

47420 **APTIC NO. 70042**

Just, Jan, Stefan Maziarka, Zbigniew Misiakiewicz, and Halina Wyszynska

ATUOMOBILES AND THE TYPE OF ROAD SURFACE AS POSSIBLE SOURCES OF AIR POLLUTION WITH CARCINOGENIC SUBSTANCES AND LEAD. *(Pojazdy samochodowe i rodzaj nawierzchni jezdni jako zrodlo zanieczyszczenia powietrza atmosferycznego substancjami rakotworczymi i olowiem). Roczinki Panstwowego Zakladu Higi, 22(5):545-551, 1971. 15 refs. Translated from Polish, 11p.*

To disprove the persisting opinion that roads and squares paved with asphalt may be the source of air pollution by polynuclear aromatic hydrocarbons, a comparative investigation of air purity was carried out along a road with different surface pavements. One stretch of road was covered with asphalt and another stretch of similar length was covered with concrete. The collection points were placed at each sector at a 6-kilometer distance from each other, i.e., 3 km from the junction of the asphalt and the concrete pavement. The air quality measurements did not establish any difference in the degree of air pollution with regard to polynuclear aromatic hydrocarbons. A high degree of air pollution by lead was determined (0.6 micrograms/cu m -- the permissible limit being 1.0 micrograms/cu m), although the intensity of car traffic was low.

47421 **APTIC NO. 69507**

Kochina, Y. V., V. D. Yablochkin, V. A. Shchirskaya, A. I. Gorshunova, and E. Chukhno

STUDY OF VOLATILE SUBSTANCES RELEASED BY POLYMERS BASED ON POLYETHYLENE HALOGEN DERIVATIVES. *In: Current Problems in Space Biology and Medicine. (Aktualnyye voprosky, kosmicheskoy biologii i meditsiny). p. 166-169, 1971. Translated from Russian. Joint Publications and Research Service, Arlington, Va., p. 25-68, July 14, 1972.*

NTIS: JPRS 56499

The sanitary and chemical characteristics of groups of polymers emitted by the polyethylene halogen compounds used in various construction materials are discussed. Three samples from polyvinyl chloride and three samples from polytetrafluoroethylene materials were studied at room temperature (20 C) and increased temperatures. At a temperature of 40 C and with an exposure of 10 days, samples based on polytetrafluoroethylene did not release volatile substances, except for fiberglass with a fluoroplastic coating. In goods fabricated from polyvinyl chloride at 20 C and with a 10-day exposure, substances were not released or included small quantities of plasticizer, dibutyl phthalate. At 40 C, dibutyl phthalate, carbon monoxide, hydrocarbons, and hydrogen chloride were released. At 100-200 C materials in both groups released complex gas mixtures formed as a result of the thermooxidative destruction of both polymers and auxiliary products employed in the process of fabricating materials.

47422 **APTIC NO. 70045**

Markov, A. P.

EXPERIENCE OF SANITARY-VIROLOGICAL SEWAGE TESTS. *(Opyt sanitarno-virusologischeskogo issledovaniya stochnykh vod). Preprint, Orel Regional Sanitary-Epidemiological Station (U.S.S.R.), 1971 (?). 3 refs. Translated from Russian, 3p.*

Since enteroviruses in sewage can be circulated among the population, regular sanitary-virological sewage control is of great epidemiological importance. The distribution of enteroviruses in sewage using two methods of sample treatments was studied. Treated samples of sewage were tested on two samples of tissues (Ner-2 and human embryo fibroblasts). The treatment of samples with antibiotics was tested.

47423 **APTIC NO. 68554**

Miller, C. E.

AIR POLLUTION. GENERATION AND CONTROL. *Louisville Univ., Ky., Speed Scientific School and American Society of Civil Engineers, Kentucky Section, Environ. Eng. Sci. Conf., Proc. Annu. Meet, 1st, Louisville, Ky., 1971, p. 1-31. (March 19.)*

A historical perspective is given to the history of automotive exhaust emissions and legislation to control them. the Clean Air Act, Air Quality Act of 1967, California and other state standards and laws, and the Clean Air Act Amendments of 1970 are reviewed with respect to automotive pollution. Vehicular pollutants are described, and their standards, measurement methods, toxic effects, and photochemical reactions are discussed. The major automotive pollutants reviewed are carbon monoxide, hydrocarbons, nitrogen oxides, and lead. Reaction mechanisms in internal combustion engines which produce these pollutants are discussed. Several test procedures developed in the U. S. are reviewed, including the dynamometer, the seven-mode cycle of testing, constant volume sampling, the idle test, the simplified dynamometer test, the quasistatic test, and the ACID test. Control devices are described including carburetion and air/fuel ratio variations, spark retarding, position crankcase ventilation, crankcase and exhaust scavengers, and catalytic converters. A vehicle inspection program is also discussed.

47424 **APTIC NO. 65669**

Japan Environmental Health Center

REPORTS ON INVESTIGATIONS OF BAD ODORS FROM ANIMAL OFFAL PROCESSING AND POULTRY FARMS IN THE SOKA AND KOSHIGAYA AREAS, SAITAMA PREFECTURE, AND FUTURE COUNTERMEASURES. *(Saitama-ken Soka-shi oyobi Koshigaya-shinai kaseijo narabi ni yokeijo akushu kogai jittai chosa to kongo no taisaku ni tsuite no chosa hokokusho). Text in Japanese. 212p., March 1971.*

Special odor investigations were conducted in Soka and Koshigaya, Saitama Prefecture around a fish oil processing plant and a fish meal plant to obtain some basic data for odor countermeasures. The tests included an olfactory sensitivity test, a questionnaire, and gas chromatography analysis. Tests at the oil processing plant animal bone scrubber exhaust detected acetaldehyde, furan, acetone, acrolein, benzene, isobarenaldehyde, toulene, p-xylene, m-xylene, and ammonia. Benzene, toluene, and xylene were detected at the ppb level in the atmosphere around the plant. An area covering a radius of 1 km was investigated by questionnaire. In all cases, complaints were registered that the odor was growing more intense over the years; it is particularly bad in spring and summer, in morning and evening, and when the wind direction is south to southwest. At the fishmeal processing plant, trimethylamine, monomethyl amine, acetone, benzene, and toluene were detected in the GC analysis of the scrubber exhaust gas sample. Up to 9.7 ppb of benzene, 6.9 ppb of toluene, 3.6 ppb of p-xylene, and 5.7 ppb of o-xylene were detected. As in the case of the other plant, most complaints came from housewives who were home all day. The bad odor seemed to be particularly intense in spring and summer, during southwest to southeast winds, and on cloudy days.

1969

47425 **APTIC NO. 75028**

Person, Goran, Bengt Westergard, and Ulf Hogstrom

AIR POLLUTION FROM LOCAL HEATING. *(Luftfcrorening fran lokaluppvarmning). Statens Naturvardsverk, Solna (Sweden) and Uppsala Univ. (Sweden), 32p., 1969. Translated from Swedish, 54p.*

The heating methods used in densely populated towns (those with more than 15,000 persons) in Sweden were surveyed to determine the significance of local heating on air pollution. Information was gathered regarding the type of heating (oil burning, electric heat, solid fuel burning, distribution of heavy and light fuel oils), plans for remote heating, and monitoring of sulfur dioxide and soot pollution. The results of this study are given, and the advantages of central, remote heating on air pollution reduction are discussed. Appendices are given on the cities surveyed, on present remote heating plans in Swedish cities, on the results of soot and sulfur dioxide measurements in Sweden, on local public health regulations for oil-burning heating installations in Stockholm, and on a proposal for regulations by the Goteborg city public health authority.

1966

47426 **APTIC NO. 69887**

Zdrazil, J. and F. Picha

THE OCCURRENCE OF THE CARCINOGENIC COMPOUNDS 3,4-BENZPYRENE AND ARSENIC IN THE SOIL. *Neoplasma, 13(1):49-55, 1966. 7 refs.*

Soil sample analyses for the carcinogens arsenic and 3,4-benzpyrene were made in an urban environment surrounding a coal-burning steam electric plant. Coal was also used for urban heating in the area. Soil samples from gardens in the housing district contained concentrations of 3,4-benzpyrene ranging from 0.026-0.939 mg/kg. Arsenic levels (near the power plant) were as high as 37.0 mg/kg, though values in the dwelling area did not exceed 10 mg/kg. Concentrations of 3,4-benzpyrene in the immediate vicinity of the power plant ranged between 0.022-0.112 mg/kg, while those near a railway track were higher, ranging from 0.312-2.040 mg/kg. Analyses of flue dust collected from power plant stacks showed only minute amounts of 3,4-benzpyrene (0.003 mg/kg) and concentrations of arsenic ranging from 43.0-110.4 mg/kg, while concentrations of the two pollutants in the soot of local heating equipment chimneys ranged from 26.0-78.0 mg/kg and up to 57 mg/kg, respectively. The soot from steam locomotive shed chimneys showed abnormally high 3,4-benzpyrene concentrations (427.5-675.0 mg/kg). Soil samples from a nonindustrial area where railroad and heating exhaust emissions were absent showed 3,4-benzpyrene concentrations ranging from 0.002-0.127 mg/kg.

1949

47427 **APTIC NO. 67719**

Kohlmeyer, Ernst Justus

REDUCTION OF IRON OXIDES DURING FUSION. *(Ueber die Reduktion von Eisenoxyden im Schmelzfluss). Text in German. Arch. Eisenhuettenw., 20(11-12):345-347, Nov.-Dec. 1949. 5 refs.*

The reduction of ferric oxide and its mixtures with other metal oxides in a fused state was studied in laboratory tests. The smoke released during the reduction in the molten state was due to the formation of an instable iron-carbon monoxide complex at temperatures above 1400 C which is first decomposed into fine iron dust to be subsequently oxidized to ferrous oxide, and further to ferric oxide in the furnace atmosphere, which results in the release of a brown smoke. Thus, the evaporation directly of ferric oxide from the molten bath is ruled out.

CONTROL METHODS

1975

47428 **APTIC NO. 69876**

Kubicka, Rudolf and J. Cir

LOW SULFUR FUEL OILS FROM MINERAL OIL. *(Schwefelarme Heizoele aus Erdoel). Text in German. Chem. Tech., 27(1):33-35, Jan. 1975. 28 refs.*

On the basis of an extensive literature review and of results from laboratory examinations, a survey of methods for the manufacture of low-sulfur fuel oils from mineral oil is given. Low-sulfur fuels are obtained basically by direct and indirect processes. Most direct desulfurization processes operate at pressures between 70 and 210 bar and at reaction temperatures between 340 and 430 C. The consumption of hydrogen amounts to between 100 and 200 cu m/ton of raw product depending on the degree of desulfurization, on the operating pressure, and on the extent of hydrocracking. Catalysts for hydrocatalytic desulfurization must be highly selective, have a large pore volume with a large average pore diameter, and have little tendency toward cracking reactions or coke formation. For the protection of the catalysts and for prolonging their lifetime, guard reactors filled with inexpensive contact material precede the catalysts in the most plants nowadays. Indirect desulfurization differs from direct desulfurization by being preceded by processes for the removal of ash forming substances, asphaltenes, and resins. Capital investment costs for a hydrodesulfurization plant with integrated coking process are naturally higher than for direct desulfurization. The advantage of the indirect method, however, is that for hydrogenating desulfurization of gas oils coming from the coking stage, only pressures between 50 to 60 atm are needed and the lifetime of the catalyst reaches two years.

47429 **APTIC NO. 70074**

Meyers, R. A., J. W. Hamersma, and M. L. Kraft

SULFUR DIOXIDE PRESSURE LEACHING. NEW POLLUTION-FREE METHOD TO PROCESS COPPER ORE. *Environ. Sci. Technol., 9(1):70-71, Jan. 1975. 2 refs.*

Copper smelters in the U. S. annually emit 3.0 times 10 to the 6th power tons of sulfur dioxide into the atmosphere, causing a majority of the air pollution problems in some western states. The current industrial technology which causes sulfur oxide air pollution involves pyrometallurgical treatment of copper sulfide ores. A pressure-hydrometallurgical reaction was developed which causes SO2 and hydrochloric acid to recover copper from copper ore while converting both the SO2 and the ore's sulfide content to elemental sulfur. This preliminary finding could provide a basis, after full engineering testing and development, for pollution-free refining of copper. (Author abstract)

47430 **APTIC NO. 70093**

Miyamoto, Seiichi and Hinrich L. Bohn

FILTRATION OF AIRBORNE PARTICULATES BY GRAVEL FILTERS: II. COLLECTION EFFICIENCY AND PRESSURE DROP IN FILTERING FUME. *J. Air Pollution Control Assoc., 25(1):40-43, Jan. 1975. 9 refs.*

The collection efficiency of gravel layers to remove ammonium chloride fumes from dry air streams is initially low, but increases sharply with increasing particulate load on the gravel. The pressure drop across the gravel layer is low and changes little with particulate load until it reaches a threshold load, whereupon the pressure drop increases abruptly with erratic fluctuations. The effects of gravel size, layer thickness, and air flow velocity upon efficiency versus particulate load, pressure drop versus particulate load, threshold load, and the cumulative collection efficiency from zero load to the threshold load are presented based on an experimental study. The application of these data for air filtration is also discussed. The use of single layer gravels with periodic cleaning operations appears promising in removing fume and dusts under a wide range of flow velocities. The use of multilayer filters has been limited; the experimental data could be used as a tentative guide, but require further tests, especially at low particulate concentrations for more accurate design. The possibility of mist removal by multilayer gravel filters and the use of moving gravel beds also should be explored. (Author abstract modified)

47431 APTIC NO. 70255

Nishida, K.

PRESENT STATUS OF ODOR CONTROL PROGRAMS AND THEIR CONTROVERSIAL POINTS. *(Akushu taisaku no genjo to mondaiten). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(1):50-54, Jan. 1975.*

General information on the prevention of odors, emission sources, removal techniques, and measurement methods is given. Planning and zoning for industrial areas are discussed based on calculations for measurement and control of odors. Odors are very difficult ot analyze mathematically and chemically; therefore, legislation does not have a sound basis for setting up standards. The removal techniques are classified into the following methods: liquid absorption (extraction of solvent), solid absorption (absorbents), and oxidation decomposition reaction (direct burning, catalytic burning, and catalytic oxidation reactions). The relationships between removal techniques and measurement processes of odors are discussed.

47432 APTIC NO. 70233

Putanov, Paula S., Nadezda N. Jovanovic, Dejan Dj. Smiljanic, and Bozidar Lj. Djukanovic

CHANGES OF THE PORE STRUCTURE OF VANADIUM CATALYSTS FOR OXIDATION OF SULFUR DIOXIDE. *(Veraenderung der Porenstruktur von Vanadinkatalysatoren zur Oxydation von Schwefeldioxid). Text in German. Chem. Tech. (Berlin), 27(1):36-38, Jan. 1975. 15 refs.*

Through mechanical mixing of vanadium pentoxide, potassium sulfate, and silica gel using various K/V ratios, a model of a vanadium catalyst was obtained which was subjected to 60 hours of thermal treatment at 500 and 700 C in converted reaction gas. From measurements of the specific surfaces and the pore volume distributions it became apparent that two physical-chemical processes take place during tempering at the same time: the filling of the pores with the melt and the sintering of the catalyst carrier. The irreversible sintering process depend on the K/V ratio and on the gas atmosphere.

1974

47433 APTIC NO. 67555

Abe, Kenzo and Katsuji Kakemoto

ODOR CONTROL AND REMOVAL FOR SANITATION FACILITIES (OXIDATION TREATMENT). *(Seiso shisetsu no akushu bojo (sanka shori ni tsuite)). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 4(16):36-42, Aug. 1974.*

In a sewage plant, high concentration of odorous gases are emitted from the first and second aeration tanks, the hopper, and the storage tank, and low concentration gases are emitted from the pump room and dehydrator. When the material for aeration is undiluted, the concentration of hydrogen sulfide can be as high as 200-600 ppm, and that of ammonia can be as high as 750 ppm in summer. In a diluted aeration plant, H2S is about 3-80 ppm and ammonia is about 300-700 ppm. Therefore, the desining of an oxidation treatment facility requires a thorough investigation of the plant and the type of systems utilized. The amount of bubbles and the effect of defoaming greatly influence the effect of deodorization of gas from the aeration tank. Usually defoaming is achieved by jet spray water, but the defoaming device must be chosen in accordance with the needs of specific plants, and the optimum gas speed and gas-liquid ratio must be determined. The odor gas is drawn and water-scrubbed in the first absorption tower where ammonia is physically absorbed. In the second absorption tower, H2S is eliminated by an alkaline absorbent and mist is separated by a cyclone; deodorized gas is emitted. The waste absorbents are neutralized in the mixture tank and discharged.

47434 APTIC NO. 69180

Abe, Koshi, Hidehiko Hoshikawa, and Toshihiko Seki

THE DEODORIZING EFFICIENCY OF AN ODORIZER (COMBUSTION STYLE) FOR HUMAN WASTE STORAGE TANK. *(Shinyo Choryuso dasshu (nenshoshiki) no dasshu koritsu ni tsuite). Text in Japanese. Sendai-shi Eisei Shikenshoho (Sendai Municipal Rep. Inst. Pub. Health) no. 4(1972):94-98, Oct. 1974.*

Measurements of odor degree, ammonia, hydrogen sulfide, and total sulfur oxide concentrations were carried out at three human waste treatment plants. Odor degree was determined by absorbing the odorous gas in 1% sodium chloride solution before and after combustion and diluting with the same until no odor was detected. Combustion gas containing NH3 was sampled at 2 l/min with 50 ml 0.02 N sulfuric acid and the pH was adjusted to 3.7 with 0.1 N sodium hydroxide. Five ml of sodiumacetate-aceticacid buffer was added and the solution was shaken with 0.45 ml Chloramine-T solution and 1.5 ml pyridine-pyrazolone solution. The mixture was extracted with 10 ml carbon tetrachloride and the absorbance near 450 nm was measured to determine NH3 concentration. Hydrogen sulfide was determined by absorbing with zinc sulfate-sodium hydroxide-ammonium sulfate solution followed by measurement of the absorbance near 670 nm after p-aminodimethylaniline solution and ferric chloride solution were added. Total SOx was determined by titration with methyl red-methyl blue mixed solution as indicator. The odor degree, NH3, and H2S at one plant were reduced from 18 ppm to 14.5 ppm, 40.2 ppm to 11.4 ppm and 2.6 ppm to 0.12 ppm, respectively, by combustion. At a second plant the odor degree and NH3 were reduced from 6 ppm to 0 and 4.4 ppm to 2.2 ppm, and at a third, the odor degree, NH3, and H2S were reduced from 19 ppm to 1 ppm, 16.5 ppm to 2.3 ppm, and 0.13 ppm to 0.03 ppm, respectively.

47435 APTIC NO. 70140

Acres, G. J. K., B. J. Cooper, E. Shutt, and B. W. Malerbi

PLATINUM CATALYSTS FOR EXHAUST EMISSION CONTROL: THE MECHANISM OF CATALYST POISONING BY LEAD AND PHOSPHORUS COMPOUNDS. *Preprint, American Chemical Society, Washington, D. C., 33p., 1974. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)*

The influence of lead and phosphorus compounds that may be present in fuels and lubricating oils on platinum catalyst systems used for exhaust emission control is assessed. While phosphorus would appear to be the most toxic element on a w/w basis due to selective poisoning of pore mouths, interaction between phosphorus and lead compounds is such that the trace lead in fuel will contribute the major effect in long-term use. Evaluation of lead poisoning using tetraethyl lead (TEL) indicates a first order deactivation process, with adsorption of lead being predominantly controlled by the degradation of TEL prior to arrival at the catalyst surface. As a result, catalyst deactivation rate are a nonlinear function of lead adsorbed at the catalyst surface. Adsorbed lead may consist of particulate and non-particulate lead, the former giving relatively little effect on catalyst performance. The latter, which may consist of TEL or partially oxidized species of TEL, will adsorb on active sites resulting in significant degradation even at levels less than 0.05 g/USG of lead. (Author summary)

47436 **APTIC NO. 65239**

Adams, Richard L.

FABRIC FILTERS FOR CONTROL OF POWER PLANT EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-100.)*

Four separate pilot units were used in the application of fabric filters to coal-fired utility boilers. A fabric filter equipped with fiberglass fabric at an air-to-cloth ratio of approximately 3.5 to 1 resulted in a pressure drop in the range of 4 in. w.g., when handling the effluent from coal-fired boilers. Cloth cleaning is by a combination of mechanical shake plus deflation. The operating results from the first installation confirm pilot studies, and design parameters for another unit to be installed at a major Eastern utility are presented. Cost comparisons with an electrostatic precipitator on a 5000 megawatt station show that the fabric filter represents a significant reduction in capital costs on coals having a sulfur content of less than 1.5% where precipitator efficiency is required to be at least 99.5%. Basic design criteria are presented that represent the minimum design requirements for a unit to be installed on a large coal-fired utility boiler. The performance of these units can exceed that of electrostatic precipitators on many major utility installations in the United States. (Author abstract modified)

47437 **APTIC NO. 69687**

Agarwal, J. C., R. A. Giberti, P. F. Irminger, L. J. Petrovic, and S. S. Sareen

COAL DESULFURIZATION: COSTS/PROCESSES AND RECOMMENDATIONS. *Preprint, American Chemical Society, 19p., April 1974. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., 1974.)*

The Ledgemont oxygen leaching process for desulfurization of coal (pyrite removal) is described along with its economic and environmental advantages. Coal is brought into the plant and crushed and ground to a size suitable for effective leaching. The coal may be subjected to physical coal cleaning at this time to remove liberated pyrite and ash. The coal slurry is then fed to the leaching reactors where under suitable conditions of temperature, pressure, slurry density, gas dispersion, and mixing, the pyritic sulfur is oxidized only to soluble sulfates. The slurry is then separated, with the coal fraction being washed with water. The water from both the washing and leaching operations is neutralized with lime or limestone, and the iron compounds and gypsum are separated from the water and sent to a disposal area. The water is returned to the process. The washed coal minus the pyritic sulfur may be slurry pipelined to the power plant or sent to an agglomeration and drying section to prepare a material suitable for transport and storage. Advantages of the oxygen leaching process as compared with ferric sulfate leaching are that no elemental sulfur is formed, no regeneration of the leach solution is required, considerably less washing is required, and reaction time is about four times shorter than for ferric sulfate leaching. These advantages more than offset the higher capital cost of the oxygen leaching process and make it economically competitive with stack gas scrubbing for reducing the sulfur emissions from coals having low organic sulfur levels.

47438 **APTIC NO. 67082**

Agarwal, M. R.

POLLUTION CONTROL ASPECTS OF FCI TROMBAY UNIT. *Fertiliser News, 19(3):20-22, March 1974.*

The emissions and pollution control at the Trombay factory of the Fertilizer Corporation of India, Ltd. are discussed. The factory consists of a 350 tons/day ammonia plant, a 300 tons/day urea plant, a 700 tons/day complex fertilizer plant, a 200 tons/day sulfuric acid plant, a 320 tons/day nitric acid plant, a 60 tons/day concentrated nitric acid plant, a 100 tons/day phosphoric acid plant, and other plants. Under normal conditions the H2SO4 plant emits 0.2%/vol sulfur dioxide and 0.03-0.06%/vol H2SO4, according to design. Pollution control to reduce acid mist and SO2 were provided by a turbulence filter and a double catalysis-double absorption process based on the Bayer process. The nitric acid plant emits less than 0.05% nitric oxide from the treated colorless gas. The control treatment includes a catalytic combustor. The concentrated nitric acid plant emits about 2% nitrogen oxides (about 148 kg/day nitrogen dioxide). Fluorine emissions from the phosphoric acid plant are recovered. Modifications are being effected in old plants and control equipment is being installed in expanded facilities, so that the plant will meet international emission standards.

47439 **APTIC NO. 67105**

Akhtar, Sayeed, A. G. Sharkey, Jr., J. L. Shultz, and P. M. Yavorsky

ORGANIC SULFUR COMPOUNDS IN COAL HYDROGENATION PRODUCTS. *Preprint, American Chemical Society, Washington, D. C., 8p., 1974. 4 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)*

Organic sulfur compounds in coal hydrogenation products resulting from the Bureau of Mine s Synthoil process for coal conversion to low-sulfur fuel oil were determined by mass spectrometry in order to obtain subsequent qualitative information on their relative ease of decomposition by a cobalt-molybdenum/silica- alumina catalyst used in the process. The liquid products contained 14 organic sulfur compounds, 13 of which were thiophene derivatives. Their relative ease of decomposition was determined by repetitive hydrodesulfurization of coal slurries with the catalyst. Dibenzothiophene was the most difficult to decompose, followed by benzothiophene and naphthobenzothiophene.

47440 **APTIC NO. 69231**

Akimoto, Nobuyoshi

EXHAUST GAS DESULFURIZATION BY MAGNESIUM TRIHYDROXIDE. *(Suisanka maguneshiumu-ho ni yoru haien datsuryu). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 131:159-163, 1974. 11 refs.*

Wet desulfurization processes include the Chemico process, the Kawasaki process, the Hibi process, and the Tsukijima process. In the title process, sulfur dioxide dissolves in water producing sulfurous acid, which in turn reacts with a slurry of magnesium dihydroxide of pH 8.5, resulting in a solution with pH 2. Magnesium dihydroxide and magnesium sulfite promote the reaction velocity since both of them have a low solubility. Carbonate salt is not formed even with carbon dioxide present in the exhaust gas and the reaction occurs very effectively at a pH 7-8. In a reaction system in which magnesium sulfate with six waters dissolves in H2SO3 at a pH of 2.5 magnesium dihydrosulfite is produced, which in turn reacts with Mg(OH)2 producing crystalline MgS03 (6H20). In the present process heavy metals are first separated or recovered by washing them out or by use of a cyclone since they promote oxidation in the capturing solution. The amount of washing solution corresponding to that of water that evaporates is replenished to maintain the pH value in the range of 1-2. The crystal formation and the gas absorption are divided so that crystal is formed effectively. The gas flows in a reverse direction to the capturing solution. The desulfurization rate is 98% when the absorbing solution is replenished with 5% Mg(OH)2 (with the liquid and the gas in a ratio of 5 to 1) and the solution is maintained at a pH value of 6.

47441 **APTIC NO. 67928**

Aoyama, Hyogoro, Hideo Ohuchi, Seiichi Nakamura, Akihiko Oi, Yuichi Horio, Masaomi Suzuki, and Naoomi Yamaki

DURABILITY OF PLATINUM BEAD OXIDATION CATALYST FOR VEHICLE EMISSION CONTROL. *(Jidosha haishutsu gasu joka shokubai no taikyu shiken). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 9(4):14-22, July 1974. 7 refs.*

Performance and durability tests were conducted on a platinum bead oxidation catalyst for vehicle emission control, using an engine dynamometer system and leaded gasoline (0.48 g Pb/gal). The engine dynamometer was operated to follow a modified city driving schedule, while catalyst performance was estimated by the analysis of carbon monoxide and hydrocarbon content of the exhaust under a seven-mode, seven-cycling driving procedure. Catalyst deactivation was observed even at fairly low temperatures of the converter (300-600 C). Conversion of CO in the exhaust was higher than for hydrocarbons, though the conversion of both decreased with increasing mileage.

47442 **APTIC NO. 69727**

Araki, K. and S. Honda

DEODORIZATION METHOD. *(Dasshuho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-34898. 2p., Sept. 18, 1974. 1 ref. (Appl. Dec. 25, 1969, 1 claim).*

The oxidation of odors is accomplished at 250-400 degrees with tuff zeolite as catalyst. Granular tuff zeolite of 2 m diameter was packed in a quartz tube for 18 cm in length. The quartz tube was then heated to 300 C and an odorous gas containing 0.156 mg/l ammonia, 0.257 mg/l trimethylamine, 0.68 microgram/l mercaptan, 0.51 microgram/l hydrogen sulfide, and 0.166 mg/l acetic acid was passed at a flow rate of 5.5 l/min. The ammonia concentration was reduced to 0.121 mg/l whereas the others were completely removed. The catalyst lasts for long periods of time and by combining with a washing method, all odorous gases can be completely removed.

47443 **APTIC NO. 70117**

Arnold, David L. B.

CHEMICAL OXIDATION OF ODOURS BY OZONE. *Chem. Ind. (London), no. 22:899-902, Nov. 16, 1974. 10 refs.*

The removal of odors by chemical oxidation is discussed. The oxidants which can be used include permanganate, chlorine, and ozone; ozone is the most potent. On an industrial scale, ozone is produced by passing very dry atmospheric air through a high voltage electric discharge. The concentration of the ozone obtained is proportional to the intensity of the discharge and is normally between 10 and 30 g/cu m. Basically, ozonizers consist of a number of discharge elements either flat or tubular in form. The historical use of ozone for odor treatment is reviewed, and wet oxidation of odorous gases by ozone is described. Spectrographic analyses of air from a sewage sludge plant after treatment by wet scrubbing with ozone showed that odors were removed by oxidation, rather than by masking. A typical modern installation using the wet oxidation system is described, and the plant design is discussed. The advantages of the wet oxidation system are its effectiveness, its ability to treat large volumes of air from the surroundings as well as from the source of smell, and its economical running costs.

47444 **APTIC NO. 70116**

Arnold, G. D.

THE DESTRUCTION OF FUMES AND ODOURS BY THERMAL OXIDATION. *Chem. Ind. (London), no. 22:902-905, Nov. 16, 1974.*

The main sources of fumes and odors are reviewed, and incinerators to remove odors and fumes are discussed. Thermal oxidation of contaminants in an air stream will take place if the temperature of the air stream is raised above the auto-ignition temperature of the contaminants for a sufficiently long period, provided that enough oxygen is present in the air stream to complete the combustion process. Incinerator equipment performance requirements, the design of thermal oxidation systems, practical results of the performance of fume and odor incinerators, and heat recovery are discussed.

47445 **APTIC NO. 70098**

Arrandale, Roy S.

POLLUTION CONTROL IN FUEL-TANKS. *Glass Ind., 1974:16-17, Dec. 1974.*

Air pollution control in fuel-fired tanks often substitutes either a water or solids problem in the place of the air pollution. Research and improvements in the glass furnace to date has involved slowly whittling away at pollution and tightening specifications rather than fully solving pollution problems. Several ultimate solutions to eliminate glass furnace stack gas problems for once and for all are discussed. By using an electric furnace to melt the glass electrically, pollution is entirely eliminated. This would cause other problems, however, because of uneconomical production and shortages of electric power. The electric power industry has its own pollution problems as well. Nuclear electric power will probably be the future power source for glass melting.

47446 **APTIC NO. 69267**

Balluff, Robert N.

CATALYTIC CONVERTER FOR EXHAUST GASES. *(Tenneco, Inc., Racine, Wis.) U. S. Pat. 3,798,006. 5p., March 19, 1974. 6 refs. (Appl. Dec. 14, 1971, 17 claims).*

A catalytic converter for treating exhaust gases from internal combustion engines is described which incorporates an improved mounting assembly for monolithic type or honeycomb catalyst elements. The converter consists of a tubular metal shell, a gas pervious reactory catalyst element inside the shell arranged so that flow through the element is axial with respect to the shell s axis, an impregnated fibrous sleeve to resiliently mount the element inside the shell so that the outer surface of the element is spaced from the inner surface of the shell, an inlet conduit having a flange fitting welded around the outside of the shell, and an outlet conduit with a flange fitting welded to the other end of the shell s outside. The ends of the tubular shell and the fibrous lining are angularly deformed inwardly to protect the corners of the catalyst, to minimize gas impingement on the fibrous material, and to mechanically retain the catalyst in position.

47447 **APTIC NO. 70000**

Bee, R. W. and R. W. Spewak

COKE OVEN CHARGING EMISSION CONTROL TEST PROGRAM - SUPPLEMENTAL OBSERVATIONS. *Mitre Corp., McLean, Va., Environmental Protection Agency Contract 68-02-0650, ROAP 21AFF-004, Program Element 1ABO13, Rept. MTR-6684, EPA-650/2-74-062-a, 119p., Sept. 1974.*

NTIS: PB 237697/AS

Coke oven charging emissions were compared between two charging cars operating on the Brown s Island battery of the Weirton Steel Division, National Steel Corporation and an American Iron and Steel Institute/Environmental Protection Agency demonstration larry car. Charging emissions measured were: nitrogen dioxide, hydorgen sulfide, carbon monoxide, and carbon dioxide. The purpose of the test was to demonstrate the improvement in atmospheric conditions that can be obtained while charging a slot type coke oven. Both cars showed reasonable success in the improvement of operator environment based on reports from operators (nonquantitative). Both the AISE/EPA and the Weirton cars showed substantial improvement in emission control compared to older cars. The AISI/EPA car was more capable of sealing emissions during the charge, though it was less consistent in overall emissions control than the Weirton car. The relief (coking) stacks on the Weirton car appeared to account for more than 50% of its emissions, especially near the end of the charge. The AISI/EPA car was more capable of reducing emissions during this period, assuming that the drop sleeves were properly seated in the ports.

47448 **APTIC NO. 69604**

Bhatia, S. P., L. P. Marentette, T. L. C. de Souza, H. Barclay, A. Wong, and S. Prahacs

PILOT-PLANT INVESTIGATIONS OF THE REMOVAL OF REDUCED SULPHUR COMPOUNDS FROM KRAFT RECOVERY STACK GASES WITH ALKALINE SUSPENSIONS OF ACTIVATED CARBON. *Preprint, 15p., 1974 (?).*

The use of an alkaline suspension of activated carbon as a scrubbing agent for the removal of reduced sulfur compounds from kraft recovery stack gases was tested on pilot-scale in a turbulent contact absorber. At inlet concentrations of less than 200 ppm total reduced sulfur compounds, 3-5 g/l of activated carbon was sufficient for 99% removal of hydrogen sulfide and 50% removal of organic sulfur compounds. The presence of carbon was also beneficial in controlling the foaming tendency of the scrubbing solution. The total fixed capital investment of an installation using the process with a turbulent contact absorber or equivalent is estimated at about $1 million for a 500 ton/day mill. Capital cost will be 20-30% higher in cases where a venturi scrubber is added to increase particulate removal efficiency from 50-70% (attainable in the absorber) to 90-99%. The process, in either case, can be readily integrated into the recovery cycle, offering a solution to meeting stricter emission requirements for existing furnaces at a small fraction of the capital costs of a new recovery furnace. (Author abstract modified)

47449 **APTIC NO. 69451**

Bickelhaupt, R. E.

SODIUM CONDITIONING TO REDUCE FLY ASH RESISTIVITY. *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-0284, ROAP 21ADJ-029, Program Element 1AB012, Rept. EPA-650/2-74-092, 14p., Oct. 1974. 5 refs.*

NTIS: PB 236922/AS

Results from a review of recent research and two field tests at power stations are presented on the use of sodium conditioning to reduce fly ash resistivity for efficient collection by electrostatic precipitation. The two field tests were conducted at operational temperatures between 140 and 175 C, the range in which surface conduction should dominate, were both technically successful in that the resistivity was reduced by the predicted amount following the addition of sodium. Neither of the two facilities were using sodium conditioning. Potential compounds that can be considered as sources of sodium oxide conditioning agents include: sodium carbonate, sodium sulfate, sodium hydroxide, and sodium nitrate. The source of sodium should be uniformly distributed throughout all of the coal feed to insure that the sodium becomes an integral part of all the ash. A procedure is given for calculating the amount of sodium that must be added to reduce fly ash electrical resistivity to a desired value. Advantages of sodium conditioning include small capital investment, low labor cost for operation and maintenance, no material handling problems and facile adjustment of the amount of source material to compensate for sodium level changes of incoming coal. Disadvantages are source material cost and potential boiler fouling.

47450 **APTIC NO. 69090**

Bierbower, Robert G. and Jack H. Van Sciver

DESIGN OF ALLIED CHEMICAL SO2 REDUCTION SYSTEM CIRCUMVENTS MAJOR CORROSION PROBLEMS. *Preprint, American Inst. of Chemical Engineers, 9p., 1974. 4 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 76th, Tulsa, Okla., March 10-13, 1974.)*

The design of a sulfur dioxide emission control system to handle the waste gas from a new fluidized bed roasting operation designed to process some 500,000 tons/yr of nickel-containing pyrhotite concentration is presented. The sulfur values in this gas would be equivalent to about 500 long tons/day of elemental sulfur, or to over 1700 tons/day of sulfuric acid. Removal of over 90% of the sulfur dioxide from the waste gas is necessary to meet the air quality regulations of the Province of Ontario. It is essential that the SO2 recovery system have a high degree of reliability in its function as the emission control since no by-passes are to be provided to permit the metallurgical facility to operate without SO2 containment. The roaster gas would have a dry basis composition of 12-13% SO2 and 1-1.5% oxygen. In addition, the gas would contain about 25% water and 2-3 grains per SCF of dust. Trace quantities of sulfur trioxide and selenium oxide would also be present. The feed gas temperature would be about 1550 F. Design planning, special design features, and operating experience are discussed.

47451 **APTIC NO. 69878**

Boki, Keito

STUDIES ON THE ADSORPTION REMOVAL OF HYDROGEN SULFIDE GAS. 4. CHARACTERISTICS OF ADSORBENTS FOR THE ADSORPTION REMOVAL OF HYDROGEN SULFIDE GAS. *(Ryuka suiso gasu no kyuchaku jokyo ni kansuru kenkyu. 4. Ryukasuiso gasu kyuchaku jokyozai no tokusei ni tsuite). Text in Japanese. Shikoku Igaku Zasshi (Shikoku Acta Medica), 30(5):276-285, Oct. 25, 1974. 12 refs.*

The amount of hydrogen sulfide gas adsorbed was affected by the surface properties (surface pH, acid strength, acid amount, and basic amount), the surface structure (pore volume), and the surface form (scanning electron microscopic observation) of 32 tested adsorbents. In general, the amount of adsorption increased in the following order, amount of H2S adsorbed on the silicate adsorbents, on the active carbon adsorbents, and on the zeolite adsorbents. The amount of H2S adsorbed on magnesium silicate and silica gel adsorbents was mainly affected by the surface structure, and the amount adsorbed on the aluminum silicate adsorbents was affected by the distinctions on the surface forms of the adsorbents. The amount of H2S adsorbed on 10 kinds of active carbon was determined by the surface properties and the surface structures of the adsorbents. The amount adsorbed on 12 kinds of zeolites was determined by either the surface properties or by the surface structures of the adsorbents. The amount of H2S adsorbed on the silicate, active carbon, and zeolite adsorbents interacted with the heat of adsorption, and among the same kinds of adsorbents, the amount adsorbed was linearly related to the heat of adsorption.

47452 **APTIC NO. 70149**

Bowditch, Fred W.

THE AUTOMOTIVE EMISSION CONTROL STATUS - ONE YEAR LATER. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 13-31. 3 refs. (Sept. 25-27.)*

The present status of automotive emission controls on General Motors vehicles is reviewed along with projected future automotive requirements. Final control of hydrocarbons and carbon monoxide is presently achieved with an oxidizing catalytic converter as well as various engine operation modifications which also achieve reduction in nitrogen oxide emissions. Tighter NOx requirements, however, require the use of exhaust gas recirculation which results in a lowering of fuel economy levels. Using the latest air quality data and sophisticated rollback procedures, General Motors concludes that the present 1975 hydrocarbon and carbon monoxide requirements are more than adequate to protect public health well into the future, with the exception of the Los Angeles urban area. Nitrogen oxide levels will probably need to be at the 1975 California interim levels nationwide in order to adequately protect public health and to offset the lack of control of other sources. Stability in future automotive requirements is seen as absolutely essential in obtaining adequate emission control and maximum fuel economy at the same time.

47453 **APTIC NO. 75039**

Brinn, D. G.

A SURVEY OF THE PUBLISHED LITERATURE DEALING WITH STEEL INDUSTRY IN-PLANT FINES AND THEIR RECYCLING. *British Steel Corp., Sheffield, Strip Mills Div., SM/BIB/858, 13p., 1974. 62 refs.*

During the manufacture of iron and steel, large tonnages of ferruginous in-plant fines are generated which are recovered from dust extractors, gas cleaners, scale pits, and effluent-treatment plants. They occur in a variety of forms such as dry dusts, slurries, scale, and scarfings. They possess widely differing chemical and physical forms and are iron-bearing to various degrees. Various aspects of these fines are discussed, including their recycling to recover the iron ore. Generally these fines are dumped rather than recycling. It is economically and ecologically undesirable to dump these fines because they do contain valuable iron and other metals and can cause dust pollution when dumped. The development of a viable recycling process is urgently needed. The nature of blast furnace, open hearth, electric furnace, BOS (basic oxygen steel), mill scale, and other fines is reviewed. Several recycling systems are described including recycling with little or no pretreatment, simple agglomeration, straight briquetting, agglomerating with zinc removal, systems for zinc removal combined with direct reduction or metallizing of the fines, and exworks fines utilization.

47454 **APTIC NO. 69600**

Cox, B. M.

FLUIDIC AIR-FUEL RATIO SENSOR. *Preprint, American Society of Mechanical Engineers, New York, 7p., 1974. 8 refs. (Presented at the American Society of Mechanical Engineers, Petroleum Division, Petroleum Mechanical Engineering Conference, Dallas Tex., Sept. 15-18, 1974, Paper 74-Pet-21.)*

A totally fluidic air/fuel ratio sensor which can be run on air or water pressure is described. The sensor consists of two fluid resistors connected in series and generates a change ithe pressure level between the two for various air-fuel ratios. The sensor is capable of measuring air/fuel ratios from 14.7:1 to 11:1. Continuous monitoring of the air/fuel ratio is an inherent property of the device if the sample pressure can be kept constant. Applications include: testing of pollution control equipment by inspection stations, automatic control of the air/fuel ratio during warm-up and operation of an automobile engine, and dashboard indication of pollution control equipment failure. Experimental results show good linearity and sensitivity to a change in air/fuel ratio.

47455 **APTIC NO. 66824**

Crawford, A. R., E. H. Manny, and W. Bartok

FIELD TESTING: APPLICTION OF COMBUSTION MODIFICATIONS TO CONTROL NOX EMISSIONS FROM UTILITY BOILERS (FINAL REPORT). *Exxon Research and Engineering Co., Linden, N. J., Government Research Lab., Environmental Protection Agency Contract 68-02-0227, Program Element 1ABO14, Rept. EPA-650/2-74-066, ROAP 21ADG-AL, GRU.1DJAF.74, 213p., June 1974. 13 refs.*

Field studies on utility boilers to develop nitrogen oxides and other pollution control technology by modifying combustion operating conditions are described. Combustion operating modifications, chiefly low excess air firing coupled with staged burner patterns, can reduce NOx emissions from the coal fired boilers tested by 25 to 60%. For dry particulate mass loadings, the differences observed under baseline and low NOx operating conditions, are relatively minor. Unburned carbon in the fly ash increases for low NOx firing in front wall and horizontally opposed fired boilers, and decreases for tangentially fired units. Boiler efficiency calculations comparing baseline and modified low NOx operations indicate essentially no efficiency penalty for the implementation of combustion modifications to control NOx emissions. (Author summary modified)

47456 **APTIC NO. 69726**

Dairui, T., Y. Sakakihara, and O. Imai

TREATMENT METHOD FOR WASTE GAS CONTAINING NITROGEN OXIDES. *(Chisso sankabutsu o fukumu hai gasu no shori hoho). Text in Japanese. (Sumitomo Chemical Co. (Japan)) Japan. Pat. Sho 49- 35502. 2p., Sept. 24, 1974. 1 ref. (Appl. Sept. 19, 1970, 1 claim).*

A method for the treatment of waste gas containing nitrogen oxides by combustion and for the prevention of carbon deposition on catalyst is presented. Sample gas (nitric oxide and nitrogen dioxide 0.2%, oxygen 2.1-2.8%, nitrogen balance) at 17- 18 N cu m/hr was mixed with fuel gas (hydrogen 5-7%, methane 45-55%, ethane 15-25%, ethylene 1-2%, C4 hydrocarbon balance) at 0.25-0.27 N cu m/hr. The mixture was further mixed with 0.5 N cu m/hr steam, and the resulting gas mixture was preheated at 430-440 degrees. It was then passed through a platinum catalyst where combustion occurred at 670-700 degrees. The combustion gas contained 50-70 ppm NO plus NO2. No carbon deposition on catalyst was observed after 70 hr of continuous experiment. The preferable amount of steam is 1/2 to 3 times that of the fuel.

47457 **APTIC NO. 69853**

Date, Rin, Kazuo Nakagawa, and Akira Ishizuya

COMBUSTION DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan no nensho sochi). Text in Japanese. (Honda Giken Kogyo KK Tokyo (Japan)) Japan. Pat. Sho 49-41202. 2p., Nov. 7, 1974. (Appl. April 15, 1971, 1 claim).*

A device is described which injects measured amounts of liquefied gas to the secondary combustion chamber of the internal combustion engine, where ignition occurs. Thus amounts of gas necessary for ignition and complete combustion are always present, even for such situations as wet spark plugs. Liquefied gas can be furnished to the secondary combustion chamber independently of fuel supply considerations for the primary combustion chamber. A diagram of the engine and apparatus is included.

47458 **APTIC NO. 65673**

Davids, Peter and Werner Brocke

FIFTY PLANTS DEMONSTRATE STATE-OF-THE-ART. WASTE GAS DESULFURIZATION IS READY FOR APPLICATION. *(Fuenfzig Anlagen demonstrieren Stand der Technik. Die Abgasentschwefelung ist anwendungsreif). Text in German. Umwelt (Duesseldorf), 4(3):24-29, 1974. 12 refs.*

The Federal Republic of Germany, which in the second half of the 1960 s had a technological lead over other countries in the development of desulfurization methods, fell behind the U. S. and Japan in the last few years. In these two countries more than 50 desulfurization plants are in operation in coal and oil-fired power plants with a combined capacity of 20,000 MW, which is one third of the present capacity of thermal power plants in the Federal Republic of Germany. A survey of the most important desulfurization processes is given. With the satisfactory results gained with practical application of desulfurization the discussion concerning the availability of reliable technology of a few years ago has meanwhile shifted more to a discussion concerning the use of the end product. In the majority of plants in Japan and the U. S. calcium compounds are produced as end product. The quantity of such end products is estimated to be relatively small with regard to the large quantity of other waste products which go into sanitary landfills so that disposal does not seem to pose any difficulty. After mechanical dewatering these end products are harmless with regard to groundwater pollution. It would be of advantage, however, if part of these end products could be reused. In Japan all 18 desulfurization plants which will be in operation by the end of 1974 will have installations for the production of gypsum from the end product of waste gas desulfurization since there is a large market for gypsum. In the Federal Republic of Germany there would also be a certain demand for gypsum. Cost estimates in the Federal Republic of Germany yielded cost increases for oil-fired power plants from 0.1 to 0.4 cents/kwh for desulfurization.

47459 **APTIC NO. 75029**

Davydova, I. V.

INSTALLATION WITH AUTOMATED QUALITY CONTROL OF A WATER-COAL SUSPENSION IN INDUSTRIAL CONDITIONS. *(Ustanovka s automaticheskim regulirovaniyem kachestva vodougol noy suspenzii v promyshlennykh usloviyakh). (Source not given.) 1974 (?). Translated from Russian, 7p.*

A continuously operating installation for the preparation of a coal dust suspension in which the humidity of the suspension is controlled automatically was developed for the combustion of a water-coal suspension in the firebox of a steam boiler whose output capacity was 150 tons/hr. The output of the installation was 35 tons/hr. The process flow of the installation is described, and the operation of the installation is discussed. The installation was tested, and with 50-52% humidity and 36 tons/hr capacity it demonstrated the operating reliability of the density and suspension level control devices. This method can be used to utilize coal-water suspensions obtained from the flotation cleaning of coal as a fuel.

47460 **APTIC NO. 65446**

Dennis, Richard, Robert Bradway, and Reed Cass

BRAXTON SONIC AGGLOMERATOR EVALUATION (FINAL REPORT). *GCA Corp., Bedford, Mass., Technology Div., Environmental Protection Agency Contract 68-02-1316, Task 1, Program Element 1AB012, ROAP 21ADL-04, Rept. EPA-650/2-74-036, 82p., May 1974. 3 refs.*

NTIS: PB 234146/AS

A novel air pollution control system is described. It is a sonic agglomerator, an alternating velocity precipitator, designed to decrease the number and increase the size of particles in a gas stream by agglomeration induced by a standing sound wave through which the aerosol moves. A prototype unit was tested to determine its basic performance characteristics and to evaluate the effect of the addition of water and/or steam to the system's performance. Results from those tests using resuspended cupola dust indicated that the device decreased the mass of fine particles, but that the reduction was more highly correlated to the use of water sprays than to the use of the sonic generator. The correlation coefficients relating the use of sound and water sprays to fine particle reduction were statistically significant, but the correlation coefficient for steam addition was not statistically significant. The particle size distributions of the fine particles at both the inlet and outlet of the sonic agglomerator were determined with Andersen cascade impactors. Although shifts between the inlet and outlet size distributions were often observed, there was no clear trend to the changes and they could not be correlated to system operating parameters. (Author abstract modified)

47461 **APTIC NO. 69314**

DePalma, T. V., Vladimir Haensel, M. J. Sterba, and J. E. Thoss

ENERGY AND EMISSION CONTROL. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1974. 2 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740561.)*

New cars represent a deliberate choice to lower emissions at the expense of fuel economy. The compatibility of emission control and gasoline conservation for the automotive vehicle are considered. When catalytic converters are used, better mileage and better driveability will be experienced; the pre-emission control fuel economy will not, however, be regained until higher compression ratio engines are used. Such engines will require a fuel of about 96 Research Octane Number. The use of catalytic converters requires that such a fuel be lead-free. This combination should reduce pollution from carbon monoxide and hydrocarbons and also eliminate pollution from lead and its additives. The use of catalytic converters to control HC and CO will be expanded in the future to control nitrogen oxides. This technological advance should give environmental control and maximum conservation of transportation fuel. The relationships between compression ratio, octane number, vehicle efficiency, and fuel consumption are discussed. Tests of catalytic system performance and catalyst deterioration are described. Efforts to control HC, CO, and NOx with use of a catalytic system are also described. (Author abstract modified)

47462 **APTIC NO. 70178**

Doelp, Louis C., David W. Koester, and Maurice M. Mitchell, Jr.

OXIDATIVE AUTOMOTIVE EMISSION CONTROL CATALYSTS – SELECTED FACTORS AFFECTING CATALYST ACTIVITY. *Preprint, American Chemical Society, Washington, D. C., 13p., 1974. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 4, 1974.)*

Factors affecting the activity and the stability of that activity toward thermal exposure and the effects of lead and sulfur are discussed. These factors are: the effects of total metals loading, catalyst composition, metals distribution between catalyst particles and within the catalyst particle, and aspects of the difference between particulate and monolith catalysts. For most of the experimental results reported in this paper, the activities were measured in a bench test assembly.

47463 **APTIC NO. 70090**

Dupoux, Jean and Albert Briand

AIR FILTER EFFICIENCY AS A FUNCTION OF PARTICLE SIZE AND VELOCITY. *Water, Air, Soil Pollut., vol. 3:537-549, 1974. 8 refs.*

The air filtration theory demonstrates the existence of a minimum efficiency value for some aerosol particle sizes and velocities. Through experiments, many laboratories have sought to prove this efficiency minimum while using industrial filter pads. Generally used methods, involving monodisperse aerosol generation, are difficult to implement. A laboratory experiment is described which is ready for semi-industrial application. The method uses a new type of particle counter and a lightly polydispersed soda-fluorescein (uranin) aerosol. Air filtration concepts and detailed experimental models are described. The findings with high-efficiency paper filters, alfa fiber filters, asbestos, and fiberglass filters are discussed. The efficiency minimum occurs for 0.15 micron diameter sodafluorescein particles. Filtration velocity influence on efficiency is also demonstrated. Known results are compared with sodafluorescein aerosol and with sodium chloride aerosol findings. (Author abstract modified)

47464 **APTIC NO. 67087**

Earl, Christopher B. and Brian H. Potter

THE WELLMAN-LORD SULFUR DIOXIDE RECOVERY PROCESS. *Preprint, Wellman-Power Gas, Inc., Lakeland, Fla., 14p., 1974.*

The Wellman-Lord sulfur dioxide recovery process has been successful in commercial plants of the U. S. and Japan. Five full-scale installations have now built up an aggregate operating experience of 7 years. The 11 emission sources controlled by the process include sulfuric acid plants, Claus plants, and oil-fired boilers. Since the start-up of the original plant at Paulsboro, N. J., for Olin, the process has demonstrated long-term reliability of operation and its ability to attain SO2 emission levels for lower than required by the regulatory agencies. The basic Wellman-Lord process is described, and the current status of technology is reviewed. The application to large fossil fuel-fired steam generating plants is reviewed, and capital and operating costs for a specific application are discussed. The Wellman-Lord process is based on a sodium sulfite/bisulfite absorption cycle. (Author abstract modified)

47465 **APTIC NO. 69198**

Eguchi, Yoshitomo

TREATMENT METHOD OF GASES CONTAINING SULFUR OXIDES. *(Sanka io ganyu gasu no shori hoho). Text in Japanese. (Takeda Pharmaceutical Co., Osaka (Japan)) Japan. Pat. Sho 49-38425. 6p., Oct. 17, 1974. (Appl. May 13, 1969, 1 claim).*

A simple method for adsorbing sulfur oxides in gases with vanadium oxides over porous carbon carrier is presented. The usual method of using vanadium compounds is ineffective at temperatures below 300 C, and the catalytic efficiency is easily deteriorated by dust, tar, or humidity; also adsorption of sulfur trioxide by ordinary vanadium catalysts is difficult to achieve. All other methods of adsorption using oxides of iron, magnesium, calcium, manganese, alkalized alumina, and activated carbon are expensive. This invention overcomes all of these problems. The desirable ratio of vanadium oxides is one portion of porous carbon weight to 1/1000 to 1/10 of vanadium. The carbon material may be either activated charcoal or activated coke. Activated carbon is soaked in a solution of a vanadium compound such as vanadic acid ammonium or vanadyl sulfate. After 2-3 hrs of stirring, the solution is evaporated and the carbon is baked at 250-7000 C.

47466 **APTIC NO. 69662**

Ellis, R. J.

SUPPLEMENT TO REPORT NR. 13/72-A STUDY OF THE COSTS OF RESIDUE AND GASOIL DESULPHURIZATION FOR THE COMMISSION OF THE EUROPEAN COMMUNITIES. *Stichting CONCAWE, The Hague (Netherlands), 15p., Nov. 1974.*

Costs for desulfurization of residual fuels and gasoils are estimated for Common Market Countries. Desulfurization costs can be calculated by making assumptions about future crude oil costs and the rate of escalation of equipment/manpower costs. Costs are tabulated against a range of assumptions for producing 0.5% sulfur in the desulfurized residue for the year 1980. Many refineries have residues from various crude oils differing in S content and in case of desulfurization. In these refineries a commercial fuel oil is prepared by blending 80-87% desulfurized residue with a higher S residue to the required limit, e.g., 1% S. This is less expensive than applying a lower degree of desulfurization to a larger volume of feedstock. Existing or planned units for the desulfurization of residual fuel oils are listed.

47467 **APTIC NO. 69368**

Erdman, Donald A.

REMOVAL OF SO2 IN STACK GASES. *Preprint, American Chemical Society, Washington, D. C., 6p., 1974. (Presented at the American Chemical Society Annual Meeting, Atlantic City, N. J., Sept. 8-13, 1974.)*

The development of a system for removing sulfur dioxide from stack gases at the Potomac Electric Power Company is described. The Wellman-Lord process was installed in 1969, and a Chemico-Basic Mag-Ox scrubber system replaced it in 1970. The scrubber system has shown a continued improvement in availability; it was 43.5% in August and 51% after a modification.

47468 **APTIC NO. 69493**

Ettinger, H. J., M. I. Tillery, C. I. Fairchild, and P. Lowry

FILTRATION EFFICIENCY OF RESPIRATOR FILTER MEDIA WITH CYCLIC FLOW. *In: Annual Report of the Biomedical and Environmental Research Program of the LASL Heath Division. January through December 1973. California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Atomic Energy Commission Contract W-7405-ENG36, Rept. UC-48, p. 21-25, May 1974. 5 refs.*

NTIS: LA-5633-PR

The filtration efficiency of respirator filter media with cyclic flow was studied experimentally. Collection efficiencies of filtration media and filter cartridges used on respirators were measured for a variety of particle sizes using a cyclic flow pump to simulate different human breathing patterns. The challenge aerosol used consisted of monodisperse polystyrene latex particles generated from an aqueous suspension with a compressed air nebulizer. The efficiencies were higher at higher work rates for small particles. For larger particles the trend was not clear, but there seemed to be little difference in collection efficiency with work rate. As an aerosol passes through lines from an aerosol generator to a filter to be tested for efficiency, there is an increase in median size and a decrease in number concentration due to aerosol agglomeration. The magnitude of this change and the effect it has on inplace testing was studied by determing coagulation rate constants by measuring the change in particle size distribution with respect to time using a Royco particle counter and an Anderson cascade impactor. Changes in test aerosol size due to agglomeration did not result in any significant change in inplace test filter performance. A computer assessment was made of air cleaner performance in terms of mass, number concentration, haze formation, and inhalation hazard. Results are given for challenge aerosols collected by a mechanical air cleaner with respect to particle size. Aerosol resuspension from surfaces will be studied for surfaces such as glass, metal oxide, grass, soil, vegetation, and particles.

47469 **APTIC NO. 75017**

Folachier, A. and B. Vulliermet

PREVENTION AND TREATMENT OF POLLUTION FROM LEATHER PROCESSING. *(Prevention et traitement de la pollution en megisserie). Technicuir, 8(2):6-13, Feb. 1974. 13 refs. Translated from French, 23p.*

The prevention and treatment of pollution from leather processing are discussed. Results obtained at a laboratory and a pilot plant on the recovery and recycling of solvents used in leather manufacture, and experimentation at the pilot plant on the physicochemical treatment of mixed leather processing effluents following homogenization are reported. The composition of degreasing baths and its effects on pollution were studied using the degreasing of sheepskin with a pickling agent. The decantation of residual baths may be improved by the addition of suitable polyelectrolytes, and particularly by increasing the temperature to 45-50 C. This increase in temperature may easily be obtained by the addition of low-pressure steam to the settling tank containing the baths. The total quantity of residual solvent may be increased by drying the skins in a centrifuge or by pressure. By combining drying and temperature increase, close to 70% efficiency of solvent recovery can be obtained. Not all of the recovered solvent can be reused, however. Reusability depends on its fat content and the fat content of the skins being treated. If these data are known, it is easy to compute the recyclable proportion. For the remaining quantities, or for the total quantity if the above process fails, several solutions may be considered: complete purification of the solvent by distillation with water vapor or by ordinary distillation; or combustion of the solvent phase alone or mixed with other wastes such as shavings or dust from polishing. In any attempt to treat the baths, it is more economically feasible to set up a single installation for several firms rather than small units for each plant. Residual solvents are a fuel of choice for urban incineration plants.

47470 **APTIC NO. 70158**

Friberg, Norman

HEAVY DUTY RETROFIT - A STATUS REPORT. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 237-256. 4 refs. (Sept. 25-27.)*

Chassis dynamometer tests and durability runs in New York City were performed to test various retrofit systems for their ability to reduct exhaust emissions from heavy duty vehicles. Four basic categories of retrofit devices were evaluated: lean-mixture carburetors, air bleeds, exhaust gas recirculation, and oxidation catalysts. Each system was installed on 5-10 vehicles. Carburetors and air bleeds were simple to install, reliable, and cost-effective. Carburetors resulted in hydrocarbon reductions of 3.2 to 24.7% and carbon monoxide reductions of from 17.2-36.7%; while air bleeds resulted in 50% CO reductions, though HC were increased by close to 12%. Both devices resulted in increased nitrogen oxide levels. Catalysts gave better reductions, being in the 75-90% range for both HC and CO. Durability was poor however, with catalyst efficiency dropping from 96% to 75% after one 5000 mi test. Another catalyst failed totally due to high temperatures after 2850 mi. Exhaust gas recirculation, basically an NOx control system, resulted in 20-30% NOx reductions but did not appear to be an effective strategy except for regions with serious NOx problems. The durability of recirculation systems was questionable, and drivability problems were encountered.

47471 **APTIC NO. 69743**

Fukui, Tadataka, Nariki Tanada, Yoshio Ise, and Yoshito Fusegi

STUDIES ON ADSORPTION-REMOVAL OF METHYL MERCAPTAN GAS: (1) ADSORPTION BEHAVIOR ON 10 ADSORBENTS. *(Mechiru merukaputan gasu no kyuchaku jokyo ni kansuru kenkyu: (1) 10 Shu kyuchakuzai ni yoru kyuchaku kyodo ni tsuite). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 430, 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 560.)*

Adsorption behavior of methyl mercaptan on ten kinds of adsorbents was studied. Experimental details have been described previously (32nd Meeting). Amounts of methyl mercaptan gas adsorbed on a given adsorbent varied when adsorption conditions of time and temperature were changed. Most adsorption of methyl mercaptan (15-18 by 10,000 mg/kg) occurred on two kinds of active carbon. Scanning electron microscope photographs are included.

47472 **APTIC NO. 69746**

Fukui, Tadataka, Yoshio Ise, Yoshito Fusegi, and Nariki Tanada

STUDIES ON ADSORPTION-REMOVAL OF TRIMETHYLAMINE GAS: (1) ADSORPTION BEHAVIOR ON 10 ADSORBENTS. *(Torimechiruamin gasu no kyuchaku jokyo ni kansuru kankyu: (1) 10 Shu kyuchakuzai ni yoru kyuchaku kyodo ni tsuite). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 429, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 559.)*

Adsorption behavior of trimethylamine (TMA) gas on ten kinds of adsorbents was studied. Experimental details have been described previously (Paper 570, 32nd Meeting). Unlike hydrogen sulfide gas, maximum adsorption of TMA (20 times 10,000 mg/kg) occurred on two kinds of active carbon. Adsorption was twice that observed with Zeolite. The heat of adsorption on active carbon is below 3.7 kcal/mole, and adsorbent reuse is a likely possibility. Scanning electron microscope photographs are included.

47473 **APTIC NO. 70100**

Fukui, Tadataka, Yoshio Ise, Keito Boki, and Seiki Tanada

ADSORPTION OF HYDROGEN SULFIDE GAS ON SEVERAL SYNTHETIC ZEOLITES. *Tokushima J. Exp. Med. (Tokushima, Japan), vol. 21:21-24, July 1974. 13 refs.*

Ten kinds of synthetic zeolites were tested to determine the most suitable adsorbent for H2S gas removal by a dry process. Specific surface area with argon gas and H2S gas, surface pH, and thermodynamic data of adsorbents were measured. The amounts of H2S gas adsorbed on synthetic zeolite adsorbents were affected in terms of the pore sizes of the adsorbents rather than the surface pH and the thermodynamic factors. The adsorbents No. 3, No. 7, and No. 8 showed higher adsorption of H2S than the other adsorbents and were the most suitable for practical purposes. (Author summary modified)

47474 **APTIC NO. 69191**

Fukumori, Rokuro

HYDROGEN FLUORIDE ABSORPTION TREATMENT METHOD. *(Fukka suiso no kyushu shoriho). Text in Japanese. (Asada Chemical Industry Co., Himeji (Japan)) Japan. Pat. Sho 49-38440. 3p., Oct. 17, 1974. (Appl. Oct. 27, 1969, 1 claim).*

When aluminum is electrolyzed a large quantity of fluoride gas is emitted, and this gas is usually treated by aluminum sulfate solution absorbent. But the absorption process is slow and the high temperature tends to create hydrogen fluoride from the by-product sulfuric acid when the aluminum fluoride settles. This invention prevents the secondary emission of HF and also improves the absorption rate of HF by using a solution of basic aluminum (30-60% of basicity). The HF is reacted while boiling to 30-60% base aluminum and is precipitated in the form of aluminum fluoride or its hydrate. The method of calculating basicity from the concentration of aluminum oxide and chlorine ion is described along with several examples.

47475 **APTIC NO. 69846**

Furukawa, Toshiharu, Yoshihiko Suzuki, Shigeru Masumoto, Nobuo Masuda, and Isamu Eguchi

STUDIES ON HOT GAS SELF-RECYCLING TYPE BURNER (2). VARIATIONS IN AMOUNT OF NO FORMATION DUE TO THE TYPE OF FUEL SPRAYER. *(Netsu gasu jiko saijunkan shiki bana no kenkyu (2)). Abura funmu keishiki no chigai ni yoru NO seiseiryo no henka). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 649, 1974. 1 ref. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q08.)*

An improved hot gas self-recycling type burner for suppression of nitric oxide formation is described. By blowing air of a high velocity into the combustion chamber through the ring nozzle and causing the formation of a pressure differential in front and behind the nozzle region, a portion of the gases formed by combustion is recycled, mixes with the fuel, and helps its vaporization. Construction of the combustion chamber was modified to improve heat dispersal from the flame and to lower NO formation. The concentration of NO decreased to 60 ppm for light oil combustion and to 70 ppm for crude oil combustion. A graph, table, and sketches of the burners are included.

47476 APTIC NO. 69427

Gauguin, R., M. Graulier, and D. Papee

PROPERTIES REQUIRED OF CATALYST CARRIERS FOR EXHAUST GAS PURIFICATION. *Preprint, American Chemical Society, New York, 24p., 1974. 5 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 4, 1974.)*

The chemical, textural, and mechanical properties of the main alumina carriers manufactured by Rhone-Profil together with their thermal stability are discussed. The effects of adding various oxides to the alumina on these properties are described, as well as the performance of oxide-based catalysts. Carriers with a satisfactory stability at 1000-1050 C and a sufficiently developed surface area may be obtained from pure alumina of the gamma structure. Type C carriers offer the optimum compromise for automobile exhaust emission catalysts. Light carriers such as type D are also of interest. Whether noble metals or base metal oxides are used, it is necessary to choose a carrier which enables an easy impregnation and favors the mass and heat transfers in the catalyst bed. In the case of noble metals, the choice of the carrier determines the mechanical and textural properties of the finished catalyst. If the catalyst consists of oxides, the optimum chemical compatibility should be obtained between the carrier and the oxides. If operation at higher temperatures must be considered in the future, a modified C type carrier will offer a stability range extended up to 1200 C. (Author conclusions modified)

47477 APTIC NO. 69437

Genco, J. M. and S. S. Tam

CHARACTERIZATION OF SULFUR RECOVERY FROM REFINERY FUEL GAS (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Office of Air and Waste Management Contract 68-02-0611, Task 4, EPA-450/3-74-055, 139p., June 1974. 61 refs.*

Available technology for treating tail gases from refinery sulfur plants are reviewed. Emissions of S to the atmosphere at petroleum refineries occur mainly as sulfur dioxide in process heaters, boiler, and flares, in the tail gas from S recovery plants, and as trace amounts of hydrogen sulfide which escape during routine processing operations. Sulfur recovery at petroleum refineries is done by vapor phase oxidation of H2S in straight through Claus plants. Domestic S recovery capacity found at refineries amounted to about 8000 metric tons/day in 1973. By use of tail gas processing, overall S recovery can be increased to greater than 99% of the total input S to Claus plants. Nationwide S emissions from refinery Claus plants are estimated at 0.136 times 10 to the 6th power metric tons/yr (0.272 times 10 to the 6th power metric tons of SO2) for 1975. The S contained in refinery Claus plant tail gases is estimated to be less than 1% of the 1975 unabated S emission sources. (Author summary modified)

47478 APTIC NO. 69452

Hall, Owen P., Jr. and Neal A. Richardson

THE ECONOMIC EFFECTIVENESS OF VEHICLE INSPECTION/MAINTENANCE AS A MEANS FOR REDUCING EXHAUST EMISSIONS: A QUANTITATIVE APPRAISAL (REPORT ON CRC-APRAC PROJECT CAPE-13-68). *Preprint, Society of Automotive Engineers, New York, 11p., 1974. 2 refs. (Presented at the Society of Automotive Engineers Automotive Engineering Congress, Detroit, Mich., Feb. 25 - March 1, 1974, Paper 740131.)*

Emission tests and a computer-based model for cost-effectiveness determinations were used to analyze the economic effectiveness of various vehicle inspection and maintenance programs for reducing exhaust emissions. A hybrid program involving an idle emission inspection and maintenance program as well as the mandatory replacement of air cleaners and positive crankcase ventilation valves emerged as the most cost-effective procedure for regions with a carbon monoxide problem, while a loaded mode emission inspection followed by the repair of the idle and ignition systems appeared as the most cost-effective procedure for regions having photochemical smog. Largest emission reductions were obtained with a direct engine inspection followed by an extensive maintenance treatment (approximately 10% for hydrocarbons and CO and 0% for nitrogen oxides). Emission inspections performed in state lanes were more cost-effective than inspections performed in licensed or franchised garages. Mandatory maintenance was not very cost-effective in view of the relatively low repair effectiveness of maintenance organizations; a mechanic training program designed to improve repair reliability could have a substantial effect on program effectiveness. The most cost-effective engine parameters to maintain were: idle CO, timing, ignition misfire, PCV valve, and air cleaner. (Author abstract modified)

47479 APTIC NO. 69213

Hara, Shunichi and Shoichi Ichihara

BULKING AGENTS FOR THE REMOVAL OF LEAD IN INTERNAL COMBUSTION ENGINE EXHAUST GASES. *(Nainen kikan no haiki gasu-chu no enbun no jokyo jutenzai). Text in Japanese. (Japan Catalytic Chemical Engineering Co., Osaka (Japan)) Japan. Pat. Sho 49-37353. 3p., Oct. 8, 1974. (Appl. Aug. 6, 1969, 1 claim).*

A method of preparation of a bulking agent for collecting lead emitted by internal combustion engines is described. By installing this agent in front of a catalytic packing layer, lead emission is prevented and catalyst life can be prolonged. The carrier packing material should be silica alumina or alumina carrier containing more than 65% alumina, and 150 sq m/g of surface area. The bulking agent is a mixture of sodium phosphate and potassium phosphate. The mol ratio of K and Na should be 0.4-4, and the mol ratio of K plus Na and PO4 should be 0.5-2. The temperature of exhaust gas from an internal combustion engine is about 300 C. Ordinarily, sodium phosphate and potassium phosphate melt at 200-300 C, but the mixture melts at a lower temperature. The temperature of exhaust gas will melt the mixture over the alumina carrier and this will in turn capture lead. As a sample packing material, 500 g of 4-8 mesh bauxite (alumina content 67%) with a surface area of 225 sq m/g was placed in an evaporation plate and 27 g of phosphate-potassium and 30 g of sodium phosphate were dissolved in 330 g of water and poured over it. Water was evaporated and the K-Na-PO4 mixture was solidified on the carrier. This was dried and baked for one hour at 300 C. An automobile utilizing a high octane gasoline was moved about 400 km, at 2000 rpm, 1/4 load, 8 horsepower, and boost pressure 320 mm Hg. The packing material was 1/30 of the normal quantity and contained 3.4 wt% lead after the test.

47480 APTIC NO. 68299

Hellman, T. M. and B. R. Taylor

ODOR CONTROL BY HIGH-TEMPERATURE OXIDATION. *Ann. N. Y. Acad. Sci., vol. 237:350-362, Sept. 27, 1974. 2 refs. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

Odor control by high temperature oxidation by incineration is discussed. Incineration of contaminants can be accomplished by direct combustion, thermal oxidation, and catalytic oxidation. The methods differ by the temperatures in which oxidation occurs. The overall O2 concentration of the gases being burned and the time, temperature, and turbulence of combustion interact to govern the speed and completeness of reaction with a given mixture of combustibles. Open flame direct combustion burning can achieve a maximum combustion of 99% which may not be enough to control odors. Open diffusion direct combustion can reduce emissions by techniques that increase turbulence in the flame and introduce air into the combustion zone. Furnaces or boilers can be used as a thermal oxidizer. Combustion products may contain harmful pollutants such as nitrogen or chlorine, and a scrubber may be required. Catalytic oxidizers are preferred for oxidizing contaminants in waste gas streams. The systems are the least expensive when comparisons are made at optimum levels of heat recovery.

47481 **APTIC NO. 69729**

Higuchi, Kozo, Mitsuya Yoshizumi, and Nobuyuki Nishiyama

GRANULAR COMPOSITE DEODORIZER. *(Ryu jo fukugo dasshuzai). Text in Japanese. (Hokutan Chemical Engineering Co. (Japan)) Japan. Pat. Sho 49-31875. 4p., Aug. 26, 1974. 1 ref. (Appl. July 8, 1969, 1 claim).*

A granular deodorizer containing sulfuric acid-treated carbon and ferric sulfate is described. A sample deodorizer was prepared as follows: 10 portions (by weight) of 98% H_2SO_4-treated carbon, 5 portions of ferric sulfate powder, 7.5 portions of gypsum, 2.3 portions of clay, and a solution of 0.6 portions of pearlite in 2.3 portions of 50% phosphoric acid were mixed; the mixture was applied to a granulating machine using a solution of 3.5 portions of ferric sulfate in 8.6 portions of water as spraying agent. The dry deodorizer contained 26.6 wt% H_2SO_4-treated carbon, 31.3 wt% ferric sulfate, 29.6 wt% gypsum, 7.3 wt% iron phosphate, 3.1% unreacted clay and 2.0% pearlite. The sample deodorizer showed 100% deodorizing power on ammonia after 100 hr of deodorizing.

47482 **APTIC NO. 69311**

Hishinuma, Takao and Zensuke Tamura

INDUSTRIAL FLUE GAS DESULFURIZATION SYSTEM. *(Kogyoyo haigasu datsuryu sochi). Text in Japanese. (Hitachi Co., Tokyo (Japan)) Japan. Pat. Sho 49-27947. 4p., July 22, 1974. 3 refs. (Appl. Sept. 21, 1966, 2 claims).*

A desulfurization method for industrial exhaust gases is described. A column contains activated charcoal which moves downwards, is recycled, and can be replenished as necessary. The stages in the column, from top to bottom, are as follows: low-temperature absorption layer; high-temperature absorption layer; high-temperature desorption layer by means of high-temperature inactive gas; cooling layer. The activated charcoal which leaves the bottom of the column at the cooling stage is carried up by elevator to the low-temperature absorption layer at the top of the column, and recycled. The industrial waste gases are passed through the high-temperature absorption layer, then the low-temperature absorption layer, and passed into the atmosphere. In the high-temperature desorption stage, the sulfur oxides are desorbed from the charcoal by inactive gas introduced from the bottom of the stage. Heater, blower, and water-wash equipment for gas regeneration are placed at the top of the stage. In the cooling stage, water jet nozzles are placed at the top of the stage, and inactive gas is supplied from the bottom. The steam which arises is separated from the charcoal, and removed at the top of the cooling stage. This extracted gas mixture is condensed, and the inactive gas and water vapor are separated. The gas is recycled, and the water is discarded. The second claim concerns the attachment of a condenser at the top of the cooling stage for recovery of SO_2, in the desulfurization arrangement described in the first claim.

47483 **APTIC NO. 70248**

Hofmann, W. M.

PRESSURE LOSS OF MOIST AEROSOL FILTERS. *(Druckverlust feuchter Schwebstoffilter). Text in German. Heizung Lueftung Haustech., 25(11):370, 1974. 6 refs.*

Earlier experiments with aerosol filters of glass fiber material have shown that at high relative humidity the moisture intake increases. For determination of the accompanying rising pressure loss in the filter new experiments were conducted with the same type of filters and the same dust load as in the earlier experiments. The pressure loss was measured at constant air volume flow and constant air temperature but changing humidity. The measurement error for the pressure loss was plus or minus 3%. Measurable changes of the pressure loss occurred only at humidities of higher than 80%. Aerosol filters of glass fiber material should be passed only by well mixed air with a relative humidity below 80%.

47484 **APTIC NO. 65537**

Homberg, Otto A. and Alan H. Singleton

CLAUS PLANT PERFORMANCE AND PROBLEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-186.)*

The application of Claus Plant sulfur recovery units to the coke oven gas (COG) acid gases at three Bethlehem Steel Corp. plants is discussed. Special consideration must be given to the effect of components not normally encountered in the typical Claus plant application to petroleum derived gases. The feed composition to the three units was sufficiently different to expedite recognition of the source of some of the difficulties. Hydrogen cyanide is normally found in COG acid bases because a substantial quantity survives the burner flame. It causes extensive corrosion and methods for its elimination are discussed. A second major contaminant in COG acid gases is particulate iron sulfide and iron cyanide. Their exact source is in doubt, but if they are not removed, they cause inorganic blockages within the Claus plant. By properly accounting for the special properties of coke oven gas derived acid gas, short term S recovery efficiencies of 95% and higher are achieved. (Author abstract modified)

47485 **APTIC NO. 69722**

Hongo, Taizo and Yoshiro Fujioka

BAD ODOR GAS AND DUST ELIMINATION DEVICE. *(Akushu gasu oyobi baijin jokyo sochi). Text in Japanese. (Kawasaki Heavy Industries (Japan)) Japan. Pat. Sho 49-26421. 4p., July 9, 1974. (Appl. Sept. 9, 1970, 1 claim).*

An invention for odor and dust eliminating apparatus for shell mode casting machines and foundries is described. The apparatus has the following characteristics: two tar-removing chambers connected to the casting machine by gas ducts; a blower which introduces gas from the tar-removing chambers to the bottom of a packing tower; an absorbent storage tank and a liquid circulating pump which supply absorbent through a liquid filter to the top of the packing tower; a liquid sprinkler which disperses the absorbent from the top of the tower; a gas filter through which the gas is filtered after contacting the absorbent; a flowmeter which controls the flow rate of the absorbent and a pH meter which measures the pH value of the absorbent in the storage tank; an electromagnetic valve which receives signal from a pH adjuster and determines the quantity of fresh absorbent to be supplied. The odor concentration in the gas to the tar-removing chambers is adjusted to 30-100 ppm by the gas blower and the amount of air introduced into the gas duct.

47486 **APTIC NO. 69212**

Honma, Keiichi, Satoru Koyama, and Yoshinori Komiya

THE CONCENTRATION OF SUSPENDED PARTICULATE MATTER OF INDOOR AIR AND THE EFFICIENCY OF DUST CLEANING DEVICES IN BUILDINGS. *(Shitsunai no fuyu funjin nodo to jojin sochi). Text in Japanese. Kuki Seijo (Clean Air, -J. Japan Air Cleaning Assoc., Tokyo), 12(2):24-32, July 1974. 2 refs.*

The efficiency of dust cleaning devices in buildings was tested by low volume samplers and the results were relatively consistent. Buildings with more than 8000 sq m area had, in about 70% of the cases, out-of-door air treatment apparatus in addition to the main dust collector; only 20% of buildings between 5000-8000 sq m areas had such additional facilities. About half of all large buildings used electrostatic precipitators for the treatment of outdoor air; but for the main system of dust collection, both large and medium-size buildings utilized mechanical devices; more than half of them used auto-roll air filters. A relatively new trend is the combination of an electrostatic precipitator unit and auto-roll air filters or an electric induction filter. Another trend is the use of more efficient filter materials than the auto-roll or unit types in the form of a bag filter, thus preventing pressure losses. The equipment used for the measurement of the level of suspended particulate in office buildings was a multi-stage low vol sampler with glass fiber filter paper with a more than 99.9% collection rate of 0.3 micron stearic acid particles and the speed rate of 30 l/min. The eight buildings examined were located in the central business area of Tokyo, and except for one building which had a particulate concentration of 0.228 mg/cu m the values measured were generally low. When an electrostatic precipitator was used as the main equipment for dust collection the collection rate was about 80%. The combination of auto-roll filter and bag filter produced an 80% collection efficiency for treating outdoor air, but as a main dust collection system produced only a 30% efficiency. Calculating the suspended particulate load in a room under simplified conditions, the minimum efficiency required of a dust collector in order to maintain a desirable environmental standard was around 60%. In many cases, the mechanical devices do not meet this standard.

47487 **APTIC NO. 70087**

Hoppitt, H. B.

ODOUR AND FUME CONTROL. PART I. FILTRATION. *Chem. Ind. (London), no. 21:1-4, Nov. 1974. (Presented at the SCI, Chemical Engineering Group Symposium, London, England, March 12, 1974.)*

Methods of testing the performance of particulate filters are described, and different types of filters and fibers are reviewed. Filters for ventilation and building air conditioning, synthetic fiber filters, metal viscous filters, bag filters, high efficiency particulate arrestor filters, absolute filters, and electrostatic precipitators are reviewed.

47488 **APTIC NO. 69725**

Horimuki, Hideo

METHYL BROMIDE ABSORPTION METHOD. *(Shuka mechiru no kyushuho). Text in Japanese. (Teijin Kasei Co. (Japan)) Japan. Pat. Sho 49-35503. 6p., Sept. 24, 1974. (Appl. Oct. 23, 1970, 1 claim).*

The absorption of methyl bromide can be accomplished with alcoholic solution of monoethanolamine containing caustic alkali. Raschig rings of 1 inch in diameter were packed in a tower 3 m high and 50 cm in. inside diameter. Air containing 27.4 mg/l of methyl bromide was introduced from the top at 300 cu m/hr and an absorbent composed of 50 g monoethanolamine, 5 kg caustic potash, and 5 kg methanol was circulated from the bottom at 8 cu m/hr. The methyl bromide concentration could be reduced to below 1.0 mg/l. The alcohol is primary alcohol; the caustic alkali to alcohol ratio is 2-15 wt%; the monoethanolamine to caustic alkali ratio is 2 - 1/2 (w/w).

47489 **APTIC NO. 70277**

Hoshika, Michihisa

EXHAUST APPARATUS FOR SMOKE. *(Haien sochi). Text in Japanese. (Tateishi Denki KK Kyoto (Japan)) Japan. Pat. Sho 49-40974. 2 p., Nov. 6, 1974. (Appl. June 24, 1969, 1 claim).*

A method for controlling smoke diffusion in multi-story buildings in case of fire is described. Windows in the uppermost stories of the buildings are part of door systems that automatically open wide when fire detection alarms become operational. Smoke is sucked up and out, so that it does not diffuse throughout the floors within the building to cause death and smoke inhalation. When fire starts on the first floor of a nine-story building, for example, the window-doors on the eighth and ninth floors open wide to exhaust the smoke. Because of the chimney effect, smoke diffusion throughout the lower seven floors becomes minimal.

47490 **APTIC NO. 69821**

Huffman, Everett L.

SOLVENT REFINED COAL. *Preprint, American Chemical Society, 6p., 1974. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)*

A 6 ton/day solvent refined coal pilot plant project undertaken by the Edison Electric Institute and the Southern Company system is described. Pulverized coal is mixed with about three parts of a solvent fraction that is generated internally in the process. Hydrogen is added to the slurry of coal and solvent, and the mixture is preheated and fed into a single- stage reactor or dissolver which operates at a temperature of about 825 F and a total pressure of about 1800 psig. Under these conditions most of the carbon in the coal feed is dissolved during the residence time of 30 min, with about 60% of the organic sulfur in the coal being converted to hydrogen sulfide. The effluent from the reactor is passed to a high pressure separator where the liquid and gas phases are separated, with the liquid slurry then being subjected to a mineral separation step for removal of undissolved solids. The filtrate from which the solids are removed is flashed in a vacuum distillation column. The gas phase from the high pressure separator is scrubbed with a 20% caustic solution to remove the hydrogen sulfide produced in the reactor, and the solid residue from the filter is discharged to a rotary dryer. The ash content of the solvent refined coal product is reduced to about 0.1%, and sulfur is reduced to less than 1%. The SRC product has a higher heating value than raw coal, about 16,000 Btu/lb compared with 11,000-13,000 Btu/lb. The process appears to be competitive with flue gas processing and promises to be less expensive than some competing processes for conversion of raw coal to clean solid or liquid fuel.

47491 **APTIC NO. 68675**

Idemura, Hieo

THE PROCESS OF SIMULTANEOUS DESULFURIZATION AND DENITRATION OF SMOKE THE CHIYODA THOROUGHBRED 102 PROCESS. *(Haien doji datsuryu-dassho purosesu --- Chiyoda thoroughbred 102 purosesu). Text in Japanese. Kagaku Keizai (Chem. Ind. Econ.), 21(11):38-43, Oct. 1974. 1 ref.*

A discussion of the new, Chiyoda Thoroughbred 102 process, which is a more efficient modification of the 101 process is given. According to this process the exhaust gas is oxidized with ozone to convert nitric oxide to nitrogen dioxide. The gas is then washed with dilute sulfuric acid containing iron catalyst. Then both nitrogen oxide and sulfur dioxide are simultaneously removed from the exhaust gas. The nitrogen oxide thus absorbed is partly discharged into the air as nitrous oxide and the rest remains in solution as nitric acid. Sulfur dioxide present in the aqueous solution is then oxidized to give sulfuric acid, which is treated with limestone to give gypsum. The merits of this method are simplicity, low installation costs, and absence of secondary pollution. Other advantages are that the method is applicable to gases with high sulfur content and high metal content, gypsum of high quality is a by-product, and the Chiyoda Thoroughbred 101 desulfurization plant is easily remodeled for denitration. The cost of ozone production, which comprises a large part of the operation cost of this apparatus, is about $3.00-$3.40/N cu m O3. The total cost of operation amounts to 2-2-5% of the total power production when applied to a power plant.

47492 **APTIC NO. 69696**

Ikemura, Hisao

GAS EXHAUSTER FOR COATING CHAMBER. *(Toso shitsu no haiki sochi). Text in Japanese. (Matoko Kogyo K. K. (Japan)) Japan. Pat. Sho 49-39892. 2p., Nov. 1, 1974. (Appl. April 14, 1970, 1 claim).*

A device for removing paint particles in exhuast air from paint coating chambers was designed. A water tank is placed under the painting chamber flow (with numerous ventilation holes) and connected to the exhaust air duct located on the back or side of the painting chamber. A partition separating the painting chamber side and air duct side and with a hole for exhaust air passage is vertically suspended from the under side of the flow into the water tank. A transverse partition with a protrusion located in the air duct side is suspended from the side wall and submerged in water. By the action of an exhaust fan located at the top of the exhaust air duct, the air containing paint particles is drawn into the water tank and through the hole on the partition into the air duct side where the exhaust air and water vaporized by the drawing action of exhaust fan are mixed and paint particles covered with water are dropped into the water. The residual paint particles in exhaust air are further removed by the action of eliminators protruding from the side of the exhaust duct before being discharged into the atmosphere. The paint drops collected in water are separated by a suitable means before the water is recirculated into the painting chamber side of the water tank.

47493 **APTIC NO. 69281**

Ikeya, Fujio, Yukio Asaha, Chiaki Sato, and Shoji Takeshita

THE STATE OF BAD ODOR IN SHIZUOKA PREFECTURE AND MEASUREMENT SAMPLES. *(Shizuoka-ken no akushu no jittai to sokuteirei). Text in Japanese. Shizuoka-ken Kogai Boshi Senta Nenpo (Bull. Environ. Pollut. Contr. Res. Center Shizuoka Prefect.), no. 1:1[illegible]-140, March 1974.*

The main bad odor sources in Shizuoka Prefecture's 76 cities and townships were investigated by industrial classifications, odor control facilities, and their effectiveness. Of the 42 paper and pulp industries, 26.2% had odor control facilities that were in good operating conditions. The control methods included water scrubbers, chemical washes, incineration, oxidation, and exhaust diffusion. Of the 29 fishmeal animal, offal treatment plants, only 34.5% had odor control installations, including water scrubbing. Of the 65 wood and furniture coating workshops, only one controlled odor by any means. Of the 44 chemical factories, 31.8% controlled odor by water scrubbers, chemical scrubbers, adsorption, incineration, exhaust dispersion, and other methods. Of the 29 excretion treatment plants, 48.3% treated the odor by water scrubbing chemical scrubbing, adsorption, incineration, oxidation, and exhaust dispersion. Generally, the conditions were not satisfactory. The best treatment was combustion of exhaust gas, which is expensive both for installation of facilities and operation. The collectivization of treatment gases and treatment facilities are suggested.

47494 **APTIC NO. 65725**

Imagami, Kazunari

ON METHOD OF MEASURING PERFORMANCE FOR DUST COLLECTORS (JIS B 9910-1973). *(Shujin sochi no seino sokutei hoho (JIS B 9910-1973) ni tsuite). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):149-153, May 1974.*

Measurement of performance for dust collectors must be based on the following: temperature, static pressure, and composition of gases inside the inlet and outlet ducts of a dust collector; the amount of flowing gases in the dust collector; pressure loss; concentration of dust in the gases at the inlet and outlet ducts of the collector; the amount of flowing dust; capture rate of the dust collector; the specific gravity of the dust at the inlet and outlet ducts; particle size distribution of the dust; proper electric resistance of the dust collector; water consumption by the dust collector, and its ratio to liquid gases; the amount and condition of exhaust water; electric power consumption; and noise produced by the dust collector. Standardization of sampling methods and performance evaluation are discussed.

47495 **APTIC NO. 69741**

Imamura, Nobuji, Koki Nagasawa, and Shoichi Kageyama

DEVICE FOR SO2 REMOVAL FROM FLUE GAS. *(Endo gasuchu no SO2 o jokyo suru sochi). Text in Japanese. (Mitsui Zosen K. K. (Japan)) Japan. Pat. Sho 49-41482. 3p., Nov. 14, 1974. (Appl. Jan. 28, 1965, 1 claim).*

A removal device for sulfur dioxide in flue gas was designed. It consists of a vertical fluidized bed adsorption tower connected to the base and middle section of a smoke stack and regulated with dampers and a vertical fluidized bed desorption tower connected to the adsorption tower by two conduits for circulating adsorbent. The flue gas at 110-150 C is led into the adsorption tower where SO2 is adsorbed onto solid adsorbent such as molecular sieves, activated alumina, and activated charcoal. The flue gas passed through the adsorption fluidized bed is then led out from the top of the tower into the smoke stack. The adsorbent with SO2 is led from the top of the adsorption fluidized bed to the bottom of the desorption fluidized bed through conduit, where SO2 is desorbed by injecting superheated steam from the bottom of desorption tower. The steam (high in SO2 concentration) is led out of the desorption tower to the SO2 recovery system, while the regenerated adsorbent is returned to the adsorption tower through conduit connecting the top of desorption tower to the bottom of adsorption tower.

47496 **APTIC NO. 69226**

Indo, Eijiro, Yutaka Oguchi, Junichi Kubo, and Osamu Kuwahara

IMPROVED CATALYTIC HYDROGENATION DESULFURIZATION METHOD. *(Kairyo sareta sesshoku suisoka datsuryu hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-26924. 6p., July 13, 1974. (Appl. Dec. 26, 1970, 1 claim).*

A catalytic hydrogenation desulfurization method with the following characteristics is described: a cylindrical pressure reactor and a concentrically arranged inner cylinder; a half- conical type bubble collector on top of the inner cylinder; a conical particle capturing plate having more than one hole on the plate, which is on top of the bubble collector; and open-top gas-liquid separator on top of the capturing plate; and a cyclone connected to the upper part of the reactor by an oil pipe. Heavy oil and gas containing hydrogen are introduced into the reactor where they mix with the catalyst and the mixture ascends in the inner cylinder. The mixture overflows from the top of the inner cylinder and the catalysts are separated from the oil and gas due to the decrease of flow rate caused by the increase of cross-section area. The catalysts descend in the outer cylinder while the oil and gas mixture keep ascending to the bubble collector, which leads them into the catalyst capturing plate where catalysts carried by the oil and gas stream are captured. The oil and gas then pass through the gas-liquid separator and the oil is transferred to the cyclone where traces of catalysts are removed. The clean oil is pumped from the top of the cyclone and the catalysts are recycled to the reactor.

47497 **APTIC NO. 69884**

Ingwersen, H. H.

WHAT BECOMES OF TOXIC GASES? *(Was wird aus schaedlichen Gasen)? Text in German. Planen-Pruefen-Investieren, 26(11):82-84, 89-99, 1974.*

The new Technical Directives for Clean Air Conservation demand that vaporous or gaseous emissions of organic compounds contained in waste gases, which have been grouped into classes I to III, may not exceed the following mass concentrations not even in the presence of several organic compounds of the same class: 20 mg/cu m for organic compounds of class I at a mass flow of 0.1 kg/hr and more, 150 mg/cu m for class II at a mass flow of 3.0 kg/hr, and 300 mg/cu m for class III at a mass flow of 6.0 kg/hr. The mass of emitted substances refers to the volume of the waste gas at standard conditions (0 C, 1013 mb) after withdrawal of the moisture content. Numerous gas cleaning methods are available which will meet these demands. They include recovery of the pollutants, filtering, scrubbing, and thermal afterburning. Recovery becomes profitable above concentration of 4-5 g/cu m. The use of filters is limited to few cases. For separation of polyvinyl chloride with plasticizer vapors, electrostatic precipitators were successfully used. There are two methods of thermal afterburning--the explosion method and the reaction method. In the first case the waste air is brought to a high speed and heated to high temperatures at the same time so that the gas mixtures begin to explode. The reaction method is the more frequently applied method. The reaction temperature in the combustion chamber and the residence time influence the residual pollutant content in the cleaned gas. A review of all aspects of thermal afterburning is given in the second part of the paper, where the use of waste heat from thermal afterburning is also discussed.

47498 **APTIC NO. 67128**

Inverardi, R.

CHARACTERISTICS OF THE PAPER INDUSTRY POLLUTION CONTROL. *(Caratteristiche dell industria cartaria e lotta control l inquinamento). Text in Italian. Cellul. Carta, 25(1):41-48, 1974. (Relazione svolta della Tavola Rotonda su La cellulosa: problema economico ed ecologico nazionale, Milano, Italy, 10 Ottobre 1973.)*

An overview of the Italian paper industry s attempts to uphold ecological standards is presented. The paper industry does not cause insoluble pollution problems since there are effective ways to eliminate harmful residues by modifying production processes and recycling and purifying the waters used in paper production. Paper products are all biodegradable and can be reused. The Italian paper industry seeks harmony with the environment, especially in terms of reforestation.

47499 **APTIC NO. 69731**

Ito, Fusajiro

THE WET METHOD DUST COLLECTION DEVICE. *(Shisshiki shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-27625. 3p., July 19, 1974. 3 refs. (Appl. Dec. 7, 1970, 1 claim).*

A wet type dust collector for a cupola furnace and cast melting furnace is described. The device has the following characteristics: an air chamber which introduces air through air ducts into the stack; smoke-separating cylinders and an umbrella-type head piece concentrically arranged in the stack with gas exits between the cylinders, and between the cylinder and head-piece; chain-type dust collectors which are hung on top of the gas exits; and a water sprinkler which supplies water to the chain dust collector. The gas exits are so designed that the individual exit has very small width to prevent the water from going into the stack, but their total area is larger than the projected area of the stack. Dusts form water film on the surfaces when they encounter the water and flow along the chain collector to a precipitation basin at the bottom of the apparatus.

47500 **APTIC NO. 65240**

Janoso, Richard P.

BAGHOUSE DUST COLLECTORS ON A LOW SULFUR COAL FIRED UTILITY BOILER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1974. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-101.)*

The baghouse dust collectors installed to reduce fly ash emissions from low sulfur, anthracite coal-fired Units 1 and 2 of the Sunbury Steam Electric Station, Pennsylvania Power and Light Company are evaluated. Each boiler is rated at 80 MW. The bag filters have performed well after over a year of operation, although there is evidence of bag wear due to bag life considerations. There were no serious problems which affected boiler reliability. Problems encountered have been associated primarily with auxiliary equipment, and not with the baghouses themselves. The installation cost for the baghouses including the fly ash removal system was approximately $5,500,000. In the summer of 1973, the baghouses were tested for particulate and sulfur oxide emissions performance by the Environmental Protection Agency and results were within applicable Commonwealth of Pennsylvania regulations. Particulate emissions met the manufacturer s guarantee of greater than 99% removal efficiency. (Author abstract modified)

47501 **APTIC NO. 66639**

Kanamori, Masao

A SMOKE POLLUTION PREVENTION ADDITIVE FOR POWDER COAL COMBUSTION BOILERS. *(Tenkazai ni yoru bifuntan nensho boira no engai boshiho). Text in Japanese. (Mitsubishi Heavy Industries, Tokyo (Japan)) Japan. Pat. Sho 49-29738. 3p., Aug. 7, 1974. 1 ref. (Appl. June 11, 1964, 1 claim).*

This process is a fairly simple method wherein powdered limestone, dolomite, and other such alkaline earth metal compounds are added to powdered coal, and both are burned together in the furnace. The sulfur oxides which arise from the combustion of coal are absorbed by the activated powdered earths, and collected as flue dust. The powdered coal and the alkaline earth metal compounds are ground together before being blown into the furnace. If necessary, copper chloride or iron oxide may be added with the alkaline earth metal compounds to facilitate absorption and oxidation. Nothing much else is required of present powdered coal combustion furnaces, except for the addition of storage and supply equipment for the alkaline earth compounds, and some augmentation of the fly ash collection system and the ash treatment system. A schematic diagram of the equipment is included.

47502 **APTIC NO. 69705**

Kanatsu, Shiro

GAS EXHAUSTER FOR VARIOUS CHEMICAL TREATMENT DEVICES. *(Kakushu kagaku shori sochi ni okeru haiki sochi). Text in Japanese. (Shiro Kanatsu (Japan)) Japan. Pat. Sho 49-39890. 2p., Nov. 1, 1974. (Appl. March 5, 1970, 1 claim).*

An exhaust system for toxic gases produced by a series of processings of plating, washing, and various other chemical treatments was designed to prevent the dispersion of toxic gases in working area. Over a series of tanks containing chemical treatment solutions an exhaust duct with openings on the lower side at positions corresponding to each treatment tank is placed in parallel to the ceiling. In the space between treatment tanks and exhaust duct a carrier running on rails is placed and a hook on the carrier is used for immersing materials into treatment solutions. A hood with an exhaust fan is attached over the hook, so that the gases produced during the treatment will be drawn directly into the hood and then to the exhaust duct through the corresponding opening by the action of the exhaust fan in the hood and a fan located at one end of the exhaust duct. By the use of this exhaust system the dispersion of toxic gases into working areas can be efficiently prevented.

47503 **APTIC NO. 69703**

Kanei, Hiroyuki

AIR CLEANING DEVICE. *(Kuki senjo sochi). Text in Japanese. (Hiroyuki Kanai (Japan)) Japan. Pat. Sho 49-38629. 2p., Oct. 23, 1974. (Appl. April 30, 1966, 1 claim).*

Existing air cleaning device using filter cloth extended between two rollers, in which the clean filter surface is provided by winding up the filter cloth from one roller to the other, have a disadvantage of reducing the effective filtering surface by the bulk of filter rolls. To eliminate such a disadvantage, the existing air cleaning device was modified by using a pair of interlocking rollers separated at a given distance on a horizontal line instead of a single roller for each side. One of the rollers is rotated by a pulley or gear attached to the roller and connected to the electric motor, and the rests are driven by the interlocking action. By the use of a pair of rollers set apart on a horizontal line, the thickness of the filter roll is greatly reduced, thus providing more space for air passage and increasing the effective filtering surface.

47504 **APTIC NO. 69274**

Kennedy, David C.

ABATEMENT OF AIR POLLUTION FROM ORGANIC COMPOUNDS WITH POLYMERIC ADSORBENTS.

(Rohm and Haas Co., Philadelphia, Pa.) U. S. Pat. 3,798,876. 7p., March 26, 1974. 5 refs. (Appl. Nov. 30, 1971, 20 claims).

An adsorption-based process for the recovery of gaseous and/or vaporized organic chemicals, including odorous compounds, utilizes a polymer adsorbent to preclude capacity losses, desorption problems, and slow description kinetics associated with conventional activated carbon adsorption processes. The organic vapors are delivered into a mass or bed of a macroreticular water-insoluble cross-linked polymer composed of 10-100% by weight of polyvinyl methacrylate containing at least three methacrylate groups. The balance of the polymer consists of a monoethylenically or diethylenically unsaturated comonomer or derivatives of the polymer containing a group selected from sulfonic acid, amine oxide, quarternary ammonium amine, sulfoxide, amide, or ketone. The surface area of the polymer is 10-1000 sq m/g, and the porosity ranges from 25-85%. Average diameter of the pores is from 20-20,000 A units. The loaded polymer is contacted with a regenerant fluid to release substantially all of the adsorbed organics for disposal by means other than atmospheric discharge.

47505 **APTIC NO. 69266**

Kern, Herbert

APPARATUS FOR CONTROLLING THE EXHAUST EMISSIONS FROM INTERNAL COMBUSTION ENGINES.

(Assignee not given.) U. S. Pat. 3,797,241. 7p., March 19, 1974. 18 refs. (Appl. Aug. 9, 1971, 16 claims).

A device for introducing secondary air into the exhaust gas of an automotive internal combustion engine to reduce hydrocarbon and carbon monoxide emissions is described which unlike prior art designs has no wearing parts and results in virtually no loss in performance. A pair of exhaust collecting conduits are provided and coupled to a pulse converter which includes an inlet nozzle, a mixing tube, and a diffuser section. At least a portion of the pulse converter is thermally insulated to provide a reaction section where the exhaust gases from the engine are further combusted. A positive pressure means is provided for blowing secondary air in the immediate vicinity of each cylinder outlet prior to entry into the exhaust collecting conduits and for initiating the reaction of the exhaust gases. The primary mixing of the secondary air with exhaust gases occurs within the pulse converter, while the primary reaction of the exhaust gases occurs within the diffuser and reaction section.

47506 **APTIC NO. 75022**

Kirsanova, O. P. and I. P. Krapchin, and L. V. Semenov

PROSPECTS AND ECONOMIC EFFICIENCY OF DIRECT COMBUSTION OF SLUDGE FROM DON BASIN COAL-ENRICHING FACTORIES (ON THE EXAMPLE OF THE MOSPINO BRIQUETTE-ENRICHING COMBINE).

(Perspektivy i ekonomicheskaya effektivnost pryamogo szhiganiya shlamov ugleobogatitel nykh fabrik donetskogo basseyna (na primere Mospinskogo briketno-obogatitel nogo kombinata)). (Source not given.) 1974 (?). Translated from Russian, 12p.

During the last few years, the output of sludges in the Don basin enriching factories was considerably increased due to the higher content of fine grades in run-of-mine-coal connected with the development of combine extraction and more complex enrichment schemes. The introduction of centrifugal dehydration methods and the increase in the amount of sludge water also created conditions for the additional formation of sludges as a result of the coal abrasion and wetting of the rock contained in it. In the majority of enriching factories, the hard residue in the recycled water is as high as 280-300 g/l. A method for the combustion of finely dispersed water-coal suspensions is described, and the economic efficiency of the direct combustion of sludges in the form of water-coal suspensions using the example of the Mospino briquette- enriching factory is discussed. The Mospino briquette-enriching combine can reduce the cost of production of 1 ton of briquettes by approximately $0.375, due only to the $192,000 saved on operating expenditures. Consequently, converting the boiler room to the combustion of wastes in the form of water-coal suspensions is economically advantageous. The process can produce water-coal suspensions from the flotation washing of coal for use as a power plant fuel.

47507 **APTIC NO. 70242**

Klamann, D.

REDUCTION OF POLLUTANTS IN AUTOMOBILE EXHAUSTS.

(Verminderung von Schadstoffen in Kraftfahrzeugabgasen). Text in German. Dechema-Monograph., 74(1452-1485):39-64, 1974.

A comprehensive survey is given of the possibilities of reducing the carbon monoxide, hydrocarbon, and nitrogen oxides emissions in automotive exhaust. New engine designs and new types of fuel will not be able to replace spark-ignition, diesel, and Wankel engines during the next 10-20 years. Therefore, conventional engines will require design modifications and exhaust control measures. Hydrocarbon emissions can be abated by positive crankcase ventilation and by increasing the air-excess coefficient, while carbon monoxide emissions decrease with increasing air-excess coefficient. The nitrogen oxides emission, highest at an air-excess coefficient of 1.1, can be substantially abated by partial exhaust recirculation. The CO and hydrocarbon emissions can be reduced by reducing the quench effect. While thermal afterburners are both robust and efficient in the reduction of CO and hydrocarbons, they do not affect the nitrogen oxides. Therefore, two-stage catalytic afterburners for the reduction of nitrogen oxides and the oxidation of CO and hydrocarbons have been developed. Such catalytic afterburners require lead-free gasoline and special motor oil, and may generate additional nitrogen oxide emission in the oxidative stage.

47508 **APTIC NO. 69285**

Kobayakawa, Takashi

HYDROCARBON EMISSION REDUCTION DEVICE FOR AUTOMOBILE INTERNAL COMBUSTION ENGINE.

(Jidoshayo nainen kikan no HC haishutsuryo gensho sochi). Text in Japanese. (Daihatsu Kogyo K. K. (Japan)) Japan. Pat. Sho 49-37693. 3p., Oct. 16, 1974. (Appl. Oct. 19, 1968, 1 claim).

During deceleration using engine brakes, the negative pressure in the inlet pipe is increased abnormally, and the insufficient air supply results in the increased emission of incompletely oxidized hydrocarbons. For the purpose of reducing the HC emission during deceleration, a device was designed to maintain the throttle valve at a certain position immediately before the complete closing and to delay the ignition time in the range of 5 - 30 degree of the top dead point. The device consists of a circuit with a switch which is closed by pressing the brake pedal, a relay coil, a power source with grounding connected in series, a circuit with a switch which is opened by pressing the accelerator pedal, two relay switches with one switch which is opened by the excitation of the relay coil while the other switch is closed, a circuit with a switch, and an electromagnetic valve and power source connected in series. When the electromagnetic valve is excited, the moving iron piece rotates the throttle lever to the position immediately before complete closing.

47509 **APTIC NO. 69735**

Kobayashi, Makio

DEVELOPMENT OF SIMULTANEOUS TREATMENT TECHNIQUE FOR SOX AND NOX USING THE WET METHOD. *(Shisshikiho ni yoru SOx, NOx no doji shori gijutsu no kaihatsu). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, p. 19-32, 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

The development of emission control techniques and denitrification techniques is urgently desired for nitrogen oxides. The maximum efficiency that can be expected of any improvement of combustion mechanism is 55-60%; but within the limit that would not lower thermal efficiency, 30-40% is the best that can be expected. The Sumitomo-Fuji Kasui s Moretana type desulfurization-denitrification system eliminates dusts, sulfur oxides, and nitrogen oxides in one system. Dusts can be eliminated to improve 0.4 g/N cu m concentration to less than 0.01 g/N cu m, SOx from 850 ppm to less than 3 ppm, and NOx from 220 ppm to less than 20 ppm. The process is extremely simple and compact. The running cost is low, and a low sulfur oil can be replaced by a high sulfur oil for the operation. The liquid waste production is small, and emits about 3 cu m/hr from the treatment of 100,000 N cu m/hr of boiler flue gas. Ozone or chlorine dioxide is used as an oxidizing agent, and as absorption reduction agent, the product of desulfurization system (from the sodium, calcium, or ammonia group of desulfurization absorbent) can be used. The tower is either cubic or cylindrical and has no packing material. A counter current liquid-gas contact is created by injecting gas from the lower part and liquid from the upper part and creating alternate hydrostatic pressure.

47510 **APTIC NO. 69214**

Kobayashi, Yasuhiro

REMOVAL OF HYDROGEN SULFIDE FROM LOW PRESSURE GASES. *(Teiatsu gasu chuni okeru ryuka suiso no jokyo). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):85-87, 1974. 4 refs.*

A pilot plant was built for the treatment of hydrogen sulfide. The reaction process involves the oxidation of hydrogen sulfide to elemental sulfur by sodium ferrate in an alkaline solution. The experimental plant consists of basically two parts; the absorption tank and an oxidation tank for regenerating the oxidizing agent. The precipitated elemental sulfur is removed from the bottom of the oxidation tank. The efficiency of the desulfurization was 98.1-99.8% in a pH 9.5-11.5 solution. Selective desulfurization could be performed even in the presence of carbon dioxide and hydrogen cyanide gases if the solution pH is kept low. The advantages of the process are little side-reaction (0.5-5%), high capacity for treating sample per time (10-30 times more than current techniques), high efficiency of desulfurization, involvement of only simple apparatus, and low cost of operation.

47511 **APTIC NO. 67079**

Kobylinski, T. P., B. W. Taylor, and J. E. Young

STABILIZED RUTHENIUM CATALYSTS FOR NOX REDUCTION. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1974. 9 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25- March 1, 1974, Paper 740250.)*

Some of the problems encountered in the use of ruthenium as a nitrogen oxide reduction catalyst are described. The major problem of volatilization in high temperature oxidizing atmospheres has been overcome by providing a stabilizing matrix for the ruthenium. The stabilized catalyst, however, does not have good carbon monoxide and hydrocarbon oxidizing performance, which is required when the NOx catalyst is used for oxidation under cold start conditions. Coimpregnation of Ru and platinum is ineffective in improving this situation, and it was necessary to develop a novel procedure to improve catalyst oxidation activity. Engine dynamometer tests showed that the final catalyst performs well under all of the conditions to which it is subjected. It removed more than 90% of the NOx, CO, and HC. The durability of this NOx system in actual car operation is still unknown and is being studied. (Author abstract modified)

47512 **APTIC NO. 69291**

Kojima, Tochihiko

CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION. *(Jidosha no haiki gasu joka ni mochiiru shokubaitai). Text in Japanese. (Tomotsuru Fukuhara (Japan)) Japan. Pat. Sho 49-33705. 2p., Sept. 11, 1974. (Appl. Nov. 19, 1970, 1 claim).*

Copper or copper oxides containing 3% nickel or other nonferrous metals were molded into cylinders with spiral grooves covering the entire surface. The dimensions of the cylinder are arbitrary length, 88 mm diameter, and depth of groove 2 mm. Several small holes 2 mm in diameter and placed 10 mm apart of a long lengthwise hole 2 mm in width were cut through the cylinder for the passage of gaseous mixture. Several of the above-mentioned cylindrical catalysts are placed in the fuel inlet manifold and exhaust manifold to facilitate complete combustion, thereby reducing the concentration of toxic gases such as carbon monoxide in exhaust gas.

47513 **APTIC NO. 70179**

Korosy, L., H. L. Gewanter, F. S. Chalmers, and S. Vasan

CHEMISTRY OF SO2 ABSORPTION AND CONVERSION TO SULFUR BY THE CITRATE PROCESS. *Preprint. American Chemical Society, Washington, D. C., 15p., 1974. 21 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 5, 1974.)*

The chemistry of the citrate process was studied through each of its principal functional steps (absorption, regeneration, and sulfur melting) and important nonfunctional aspects (oxidation and purging). The action of hydrogen sulfide on sulfur dioxide in solution to produce sulfur via the citrate process depends upon controlled complex interactions among a variety of sulfur-containing species-including sulfite, bisulfite, thiosulfate, polythionates, and sulfur. The primary role of the stable citrate molecule is as an efficient buffering agent allowing greater than 95% SO2 removal from industrial stack gases, high SO2 solution loading and the recovery of high quality precipitated sulfur. Process efficiency is achieved by selectively choosing operating conditions between those required for maximum absorption and maximum regeneration efficiency. The system will tolerate stoichiometric imbalances between absorbed SO2 and regenerant H2S fed to the reactors. Potential sources of required hydrogen sulfide are discussed. The Terra Haute, Indiana, pilot plant is briefly described. A brief observation is made on economics. (Author abstract)

47514 **APTIC NO. 75033**

Koscianowska, Lidia, Jadwiga Zareba, and Jan Koscianowski

STUDY OF FABRIC FILTERS FOR INDUSTRIAL DUST COLLECTING DEVICES. *(Badania tkanin filtracyjnych dia przemyslowych urzadzen odpylajacych). Cement Wapno Gips, no. 7, 1974. 3 refs. Translated from Polish, 25p.*

Studies on the suitability of filter fabrics used in dedusting gases in the cement industry are described. The equipment used in laboratory tests and semi-industrial scale tests is described. Fabric dust collectors give good dust collecting efficiency, are not much affected by changes in fine dust size and concentration, give food purification of the gases even with different dust compositions, and have simple structure and maintenance. The type of fabric chosen depends on the magnitude of the hydraulic resistance of the dust collector, the degree of gas purification, the degree to which the fabric is saturated with dust, and the life of the filter bags. The types of fabric filters available are classified into four basic groups: filter fabrics made from natural fibers such as wool and cotton; those made from synthetic fibers such as polyester, polyamide, and polyacrylonitrile; those made from glass fibers; and those from synthetic fibers mixed with wool. In studies of these fabrics, the thermal resistance of the fabric during the long-term and short-term, resistance to wear, flexural fatigue strength, air permeability, and chemical resistance should be examined. The characteristics of domestic dust filter fabrics are listed, and the results of several studies of filter fabrics for the cement industry are discussed.

47515 **APTIC NO. 70194**

Krippene, B. C.

BURNER AND BOILER ALTERATIONS FOR NOX CONTROL. *Preprint, Babcock and Wilcox, Barberton, Ohio, Power Generation Group, 12p., 1974.*

New burner designs and new control systems for the steam generator of fossil fuel fired power plants are described. The burner was designed to burn high sulfur fuels in compliance with the Environmental Protection Agency's rules for nitrogen emissions without the use of two-stage combustion. The burners are of a limited turbulence, controlled diffusion flame type designed to minimize the amount of fuel and air mixed at the burner to that required to obtain ignition and to sustain combustion of the fuel. The remainder of the fuel and air are mixed together in the furnace to provide slow but efficient combustion while maintaining the furnace pressure parts in an oxidizing condition. Combustion air supplied to the burners can be diluted with recirculated flue gases where applicable to supplement the furnace wall cooling surfaces.

47516 **APTIC NO. 69225**

Kubo, Junichi and Yoshihisa Koiwai

AN IMPROVEMENT ON THE METHOD OF DESULFURIZATION CATALYST PARTICLE LOSS CONTROL. *(Datsuryu shokubai ryushi ryushutsu boshi ni okeru kairyo). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-26923. 5p., July 13, 1974. (Appl. Dec. 26, 1970. 1 claim).*

A method for the prevention of desulfurization catalyst loss by using a bubble collector and a catalyst particle capturing plate is described. The device has the following characteristics: a cylindrical pressure reactor and an inner cylinder concentrically arranged and packed with catalyst particles; a half-conical type bubble collector on top of the inner cylinder; and a conical particle capturing plate having more than one hole on the plate, on top of the bubble collector. Heavy oil and gas containing hydrogen are introduced into the reactor from the bottom where they mix with the catalyst and the mixture ascends in the inner cylinder. The mixture overflows from the top of the inner cylinder and the catalysts are separated from the oil and gas due to the decrease of flow rate caused by the increase in cross-section area. The catalyst descends in the outer cylinder while the oil and gas mixture keep ascending to the bubble collector which leads them into the catalyst capturing plate where catalysts carried by the oil and gas stream are captured.

47517 **APTIC NO. 69250**

Kubo, Junichi

RECENT FUEL OIL DIRECT DESULFURIZATION TECHNIQUES. *(Saikin no juyu chokusetsu datsuryo gijutsui ni tsuite). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 16(3):19-25, July 1974. 13 refs.*

The most serious problem in the direct desulfurization of heavy oil is the poisoning of catalysts by asphaltant which upon decomposition releases metals such as vanadium and nickel. The deactivation of catalyst in reduced pressure residual oil desulfurization is more significant than that in constant pressure residual oil desulfurization. In fixed-bed reactors, the catalyst cannot be removed. Therefore the space velocity must be gradually reduced as the desulfurization proceeds and the catalyst becomes less active. For extensive desulfurization a large reactor with sufficient amount of catalyst is required, which results in a significant increase in cost. The hydrogen consumption increases as the sulfur content decreases. Almost twice as much hydrogen is needed for desulfurization of residue oil containing 0.3% sulfur compared to that containing 0.7% S. A combination of direct and indirect desulfurization is employed to reduce cost, by applying indirect desulfurization to reduced pressure residual oil after hydrodesulfurization. A hydro-testing method has been developed by Chevron, which uses mild conditions and consumes less hydrogen than direct desulfurization.

47518 **APTIC NO. 69732**

Kubo, Junichi and Hiroji Nomura

CATALYTIC HYDROGENATION DESULFURIZATION METHOD FOR HEAVY OIL. *(Jushitsuyu no sesshoku suisoka datsuryu hobo). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-26925. 6p., July 13, 1974. (Appl. Dec. 26, 1970, 1 claim).*

A heavy oil desulfurization method using high fluidity desulfurization catalyst and low fluidity demineralization catalyst is described. Heavy oil and gas containing hydrogen are introduced through a disperser into an inner cylinder concentrically arranged in a cylindrical reactor. The reactor is packed with a mixture of the high fluidity and low fluidity catalysts. The oil-gas flow rate is so adjusted that the desulfurization catalysts move upward with the oil-gas mixture while the demineralization catalysts fly around but stay at the lower part of the reactor. Thus heavy oil is first demineralized (before it ascends) when introduced into the cylinder. The oil-gas-catalyst mixture ascends to the top of the inner cylinder and the catalysts are separated from the oil-gas due to the decrease in flow rate. The catalysts move downward in the outer cylinder to the bottom of the reactor and are recycled. New catalysts are supplied from the top of the reactor while aged catalysts are removed from the bottom.

47519 **APTIC NO. 69218**

Kubota, Torahide

ASSESSMENT OF POLLUTION PROTECTION AND CONTROL. *(Kogai boshi taisaku no assesumento). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):88-91, Nov. 1974.*

The meaning of pollution control in a technical sense is the removal of pollutants from the environment or at the pollution source; however, returning the removed pollutant to the environment in some way would cause secondary pollution in the future. Real pollution control, therefore, is the recovery of pollutants for reuse. An example of this is the regeneration of elemental sulfur or production of sulfuric acid from sulfur oxides emitted in industrial waste gases. Any production process should be reconsidered or redesigned if it cannot recover pollutants as raw or intermediate material for further production.

47520 **APTIC NO. 65174**

Kunibe, Susumu

THE APPLICATION METHOD FOR ACTIVATED CARBON ADSORPTION TECHNIQUES AND ITS FUTURE. *(Kasseitan ni yoru kyuchaku gijutsu no jitsuyo shuho to sono shorai). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(8):69-80, Aug. 1974.*

Activated charcoals are widely applied in the adsorption of odors. Examples show that 100 cu m/min of waste gas containing 90 ppm of xylene as a solvent for paint generates 38.4 g/min of the chemical at a pressure of 15 mm H_2O and 30 C. At an adsorption rate of 0.22 kg/kg-charcoal, 1290 kg of charcoal can be used for 123 hr, or 5 wk at 4 hr/day. Activated charcoal prepared by impregnating it with melamine and heating at 750 to 950 C shows significant improvement in sulfur dioxide adsorption (100% compared to 70% for untreated charcoal). At the present time, activated charcoals are produced from wheat, used tires, and pig secretions. Widespread waste materials are expected to be used in the near future. The trend is to develop one that has a strong adsorptive ability for heavy metal by means of chemical treatment. Combinations of absorption and other methods such as combustion, oxidation, and catalytic decomposition are also activety studied. Other important research areas are the development of good regeneration techniques and a nitrogen oxides adsorbing charcoal.

47521 **APTIC NO. 69728**

Kuribayashi, Sadatomo

HYDROGENATION DESULFURIZATION SYSTEM. *(Suisoka datsuryu sochi). Text in Japanese. (K Seven Co., Ltd. (Japan)) Japan. Pat. Sho 49-28882. 3p., July 30, 1974. (Appl. Nov. 16, 1970, 1 claim).*

A heavy oil desulfurization apparatus which is also capable of removing other impurities such as sludge is described. Heavy oil, hydrogen gas, and catalyst are pumped through a heater to the bottom of the reactor. The upper layer of the turbid solution in the reactor is pumped to a filter which has an inner and an outer chamber separated by a cylindrical sieve. Heavy oil in the inner chamber is removed through a pipe connecting to the bottom of the filter. Preheated hydrogen gas is introduced into the inner chamber of the filter occasionally. Liquid in the outer chamber of the filter is recycled to the oil-gas-catalyst mixture before it is passed through the heater. The reaction mixture on top of the reactor is also recycled into the bottom of the reactor. Aged catalyst particles and sludge are removed from the bottom of the reactor by a drainage pipe.

47522 **APTIC NO. 69714**

Kurokawa, Kozo and Teruo Kondo

HYDROGENATION CATALYST MANUFACTURING METHOD. *(Suisoka shokubai seizoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-32187. 2p., Aug. 28, 1974. (Appl. Dec. 18, 1969, 1 claim).*

A manufacturing method of alumina catalyst for hydrogenation- desulfurization improves catalytic activity by secondary treatment of catalytic supporters is described. Alumina gel containing a few percent to about 40% alumina was prepared by thoroughly mixing intermediate catalyst product with calcium hydroxide, magnesium hydroxide, or the respective carbonate followed by molding, drying, heating, and acid treatment. A sample catalyst was prepared as follows: 9% sodium aluminate solution was mixed with 8% aluminum sulfate and the mixture was filtered; the resulting alumina hydrogel, which contained 8% Al2O3, was immediately dried at 200 C; about 1.2 volumes of H2O was added to part of the alumina powder and the mixture was thoroughly mixed for 1 hr; the proper quantity of CaO was then mixed for at least 10 hrs and the mixture was molded, dried and heated at 500 C for 3 hrs; 100 ml of 2N nitric acid was added to 100 g of the resulting alumina and the mixture was allowed to stand overnight; the eluted alumina was washed and filtered, followed by immediate impregnation with cobalt nitrate and ammonium molybdate; and the resulting product was washed, dried and heated at 500 C. The catalyst so prepared gave a desulfurization rate of 73.0%.

47523 **APTIC NO. 69730**

Kurokawa, Kozo and Teruo Kondo

HYDROGENATION CATALYST MANUFACTURING METHOD. *(Suisoka shori shokubai seizoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-32436. 2p., Aug. 30, 1974. (Appl. May 23, 1970, 1 claim).*

A method of manufacturing alumina catalyst impregnated with zirconium oxide or titanium oxide for hydrogenation- desulfurization is described. Alumina is impregnated with zirconium or titanium salt and is heated in air at 400 to 700 C to form an oxide hydrate capable of ion exhanging. A catalyst sample was prepared as follows: a mixture of 100 g of alumina and 100 ml of ethanol containing 4 g of anhydrous titanium chloride was evaporated to dryness followed by washing with water, drying and heating at 500 C for 3 hr; the resulting mixture was impregnated in a mixture of 15.04 g cobalt nitrate, 17.1 g of ammonium molybdate, and 100 ml of water followed by filtration, drying, and heating at 500 C for 3 hr. The catalyst showed 68% desulfurization rate.

47524 **APTIC NO. 65670**

Kutzschbauch, K.

WASTE PRODUCTS AS SECONDARY RAW MATERIALS. *(Abprodukte als Sekundaerrohstoffe). Text in German. Technik (Berlin), 29(6):382-384, June 1974.*

In 1970 about 3.57 cu m waste products had to be handled per ton of coal removed from the mines. Valuable clay, gravel, and sand mixed with the mine wastes are lost with the present method of disposal. The expansion of power generation has increased the accumulation of ash which is increasingly used as a secondary raw material. Of the approximately 12 million tons annually about 1.5 million are re-used either in mines or in the construction industry. Annually about 15 million tons of fly ash are emitted in East Germany by industries and households, 160 kilotons of dust by metallurgical plants, and 400 kilotons cement dust. At a production of about 260 million tons of soft coal (average sulfur content 1.5%) about 3.9 million tons of sulfur were gained and not used. Assuming that about 85% of the coal is burned and 85% of the S contained in coal is emitted with the flue gases (the remaining 15% are bound by ash) an emission of 2.8 million tons of S in the form of SO2 is obtained. To this must be added 2.9 million tons emitted by fuel-oil heated firing systems. Nearly 75% of the steel in this country has been obtained on the basis of scrap. Recovered and treated waste oil covers to 65% the demand of motor oil and nearly 30% of the demand of the oil for four-stroke engines. Annually more than 400,000 tons of waste paper, of which 125,000 tons stem from households, are recycled in East Germany. Waste textiles cover 15% of the demand for raw materials and waste glass 40 to 50%. Considerable reserves are still thrown away. Of the total amount of reusable waste products with a value of 2.3 billion East Germany Marks ($0.8 billion), about 30% are discarded as trash.

47525 **APTIC NO. 70114**

Lucas, R. L.

GAS-SOLIDS SEPARATIONS: STATE-OF-THE-ART. *Chem. Eng. Progr., 70(12):52-58, Dec. 1974. 8 refs.*

Alternative types of dust collectors for a coal-fired powerhouse boiler are discussed. The particulate emission rate of the plant studied was 769 million Btu/hr, thus the allowable emission was 69 lbs/hr which corresponded to an average of 0.09 lbs/million Btu. The opacity regulation was 10% or Ringelmann 0.5. Two-stage mechanical multicyclone collectors were tested. Collection efficiency averaged 73%, regardless of pressure drop. The mass median particulate sizes were 11 micron for the inlet and 4.6 micron for the escaping dust samples. A Sharpness Index plot was used to analyze the bounce-out problem. It provides a useful performance evaluation for any particle size classifier. The Sharpness Index was 2 for the tested cyclone. For particles larger than 10 micron, the Sharpness Index plot showed data falling to the right of the line because of the bounce-out problem. Because electrostatic precipitator performance is closely tied to the electrical resistivity of the fly ash, the resistivity of the spreader-stoker boiler fly ash was measured. The stoker ash had low resistivity (less than 10 to the 7th power ohm-cm). The ability of scrubbers to remove the fly ash was then studied. A bag filter was tested. The economics of the various control methods were determined. Two-stage mechanicals had the lowest investment and operating costs, but they could not meet either the particulate or opacity regulations by themselves. Scrubbers had the highest investment and operating costs. Electrostatic precipitators and bag filters were about equal in investment and each could meet the requirements. The recommended equipment consisted of two-stage mechanicals on Boilers 1 and 3 and pulse-jet baghouses on the other four boilers.

47526 **APTIC NO. 70250**

Machida, M. and Y. Nagasawa

ELIMINATION OF DIESEL SMOKE. *(Diizeru kikan no haikikokuen no jokyo). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 13(14):27-34, Dec. 1974. 17 refs.*

The relationship of diesel smoke to nitrogen oxides generation and engine power was studied. Reduction of smoke depends on the basic properties of fine carbon particles, distribution of the carbon particles, and the growth of carbon particle size. Studies on basic properties of dusts, dust removal apparatus, and grain distribution and physical properties of exhaust carbon in smoke are discussed. An investigation on the removal of carbon particles from the furnace via an exhaust tube to eliminate black smoke exhaust is described. Diesel smoke is an accumulation of very fine carbon particles (about 0.22 micron), which have broad distribution and condensing properties. The physical properties of carbon particles are indicated. Diesel smoke may be reduced by general dust removing techniques, but after condensation of carbon particles by pretreating, the efficiency of dust removal equipment is greatly improved.

47527 **APTIC NO. 68523**

Maekawa, Teisuke

THE EFFECTS AND ACTUAL EXAMPLES OF THE DIRECT COMBUSTION DEODORIZATION METHOD. *(Chokunenshiki dasshuho no koka to jitsurei). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan) and Japan Burner Research Assoc., Osaka (Japan), 13p., 1974. (Presented at thy Seminar on Bad Odor Control Techniques, 2nd, Osaka, Japan, Aug. 1, 1974.)*

A test model for deodorization of thinner by combustion was constructed, and the efficiency for hydrocarbon elimination was examined. The thinner contained 35% xylene, 17% toluene, MIBK, acetic acid, butyl methoacetate, and isobutanol. The rate of elimination of total HC was 42% at 500 C (0.41 sec), 66.1% at 600 C (0.36 sec), 88.6% at 650 C (0.35 sec), 98.5% at 700 C (.0.32 sec) and 100% at 750 C (0.31 sec). At 600 C, only toluene and xylene remained in trace quantities and other substances were completely undetectable. However, the combustion method of deodorization is extremely expensive to operate if heat is not recovered. A combustor-deodorizer developed by the Taikisha, Co., Ltd. was designed to recover 75% of the heat created by the initial combustion by special honeycomb packing in the heat exchanger, and the fuel is required only for increasing the heat from 600 C to 700 C. The combustion is continued at 700 C, and the air at the exit is completely odorless.

47528 **APTIC NO. 69753**

Makihata, Toshiaki

FLUE GAS EXHAUST DEVICE. *(Haien sochi). Text in Japanese. (Hitachi Zosen K. K. (Japan)) Japan. Pat. Sho 49-41369. 4p., Nov. 8, 1974. (Appl. Aug. 10, 1970, 1 claim).*

A smoke stack gas curtain was designed. Spiral or coil-shaped pipes are attached to a cylindrical or multilateral tower made of multiple supports. Numerous upward nozzles or slits are placed on the pipe, and the lower end of the pipe is connected to a gas compressor. The compressed gas jetted toward from nozzles or slit forms a gas curtain which functions just like a conventional smoke stack. The number of nozzles or slits, the size, and the flow velocity of compressed gas have to be determined so that the gas curtain can withstand strong wind pressure. The structure is simple, light-weight, low-cost, and can be used readily for extending existing smoke stacks or by itself. The use of the heated compressed gas facilitates the ascent of flue gas.

47529 **APTIC NO. 70095**

Mangalick, Mahesh C.

NOW, POLLUTION CAN BE ELIMINATED FROM ALUMINUM DEMAGGING. *Light Metal Age, 1974:14-15, Dec. 1974.*

The effluents from demagging at secondary aluminum smelters are a major problem because they contain noxious halogens, their compounds, and particulate matter. As an alternative to costly pollution control equipment there are several commercially available, patented processes designed to eliminate this problem. About 60% of the secondary smelters output has to have the magnesium content reduced through halogenation or demagging, in which halogens react with magnesium in preference to aluminum to form magnesium halides. If chlorine gas is used as the halogen, effluents can contain free chlorine, aluminum chloride, alumina, or hydrochloric acid. Control equipment available include water scrubbers, coated baghouses, afterburners, and electrostatic precipitators. A process to eliminate pollution without involving control equipment involves prolonging physical contact of the reactants long enough so that the aluminum chloride reconverts to aluminum and involves recirculating the molten aluminum through the process. Efficiencies of 100% and 97% have been reported with two commercial processes using this approach.

47530 **APTIC NO. 65535**

Massey, Michael J. and Robert W. Dunlap

ECONOMICS AND ALTERNATIVES FOR SULFUR REMOVAL FROM COKE OVEN GAS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 38p., 1974. 10 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-184.)*

A status report on technology developments which have occurred from 1971-1974 in coke oven gas (COG) desulfurization is presented. Commercially proven technology for the reduction of COG sulfur to 10 grains hydrogen sulfide/100 SCF was not available in 1971, while at least one and perhaps two technologies are now available to meet this limit: Sulfiban and Stretford. Equipment for the decomposition of cyanide in acid feed gases to Claus plants was developed and tested successfully on a commercial scale. Total annualized costs for COG desulfurization are estimated to range from 4 to about 7.5 cents/MSCF of gas processed, depending upon plant size and desulfurization efficiency achieved. In liquid absorption systems, significant penalties are incurred in reducing H2S grain loading below about 50 grains which increases costs by 20-40%. In wet oxidative processing, S removal efficiencies do not influence processing costs, but substantial costs are incurred for proper treatment of cyanide related effluent streams. Stretford net system costs are competitive with liquid absorption processes and overall energy requirements are somewhat lower. Analysis of the relationship with SO2 emissions and air quality indicates that desulfurization of COG to 50 grains H2S/100 SCF allows compliance with SO2 air quality standards for the majority (greater than 90%) of coke plants. (Author conclusions modified)

47531 **APTIC NO. 69192**

Masuda, Minoru

FLUE GAS SULFUR DIOXIDE ABSORPTION METHOD. *(Haienchu no aryusan gasu kyushuho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-38426. 4p., (Appl. Nov. 7, 1969, 1 claim).*

A method of preparing a filter for sulfur dioxide in flue gas and for periodical regeneration of the filter is described. Two types of powder material, one iorganic alkali and the other material containing ferric oxide, are mixed separately with an expander, adhesive, and water. The mixtures are kneaded and formed into two separate filters of appropriate shape and size. These are inserted in the flue in two or more layers. The SO2 in flue gas is filtered and adsorbed. The filters are taken out periodically and soaked in a concentrated alkaline solution for regeneration of adsorption efficiency. The adhesive can be synthetic or natural. The expander can be bentonite, silica, diatom, or kaolin and in molding these filters, salt, pulp liquor, tar pitch, tar, and epoxy resin can be mixed.

47532 **APTIC NO. 70261**

Matsumura, Yoshimi

ADSORPTION OF MERCURY VAPOR ON THE SURFACE OF ACTIVATED CARBONS MODIFIED BY OXIDATION OR IODIZATION. *Atmos. Environ., 8(12):1321-1327, Dec. 1974. 13 refs.*

The adsorption of mercury vapor (up to 40 mg/cu m) in a nitrogen stream at 30 C by two types of treated activated carbons, carbon black, and carboxymethyl cellulose was examined. Oxidized or iodized activated carbons adsorbed mercury vapor 20-160 times more than untreated activated carbon. At equilibrium with 38 mg/cu m vapor concentrations, 1 g of untreated activated carbon adsorbed 0.68 mg mercury, while oxidized and iodized activated carbon of the same weight adsorbed 14.3 and 47.8-108.0 mg, respectively. Carbon black and carboxymethyl cellulose did not significantly adsorb mercury vapor. The preparation of the iodized activated carbon was achieved by the sorption of iodine (5 and 20% by weight with respect to the bearing carbon) onto HC-20 activated carbon from aqueous potassium iodide solution followed by subsequent drying of the carbon. The oxidized activated carbon was prepared by treating activated carbon of coconut-shell with nitric acid followed by rinsing with water. The used oxidized activated carbon was regenerated by washing with hydrochloric acid solution and water. (Author abstract modified)

47533 **APTIC NO. 69893**

Miner, J. Ronald

ODORS FROM CONFINED LIVESTOCK PRODUCTION. A STATE-OF-THE-ART. *Oregon State Univ., Corvallis, Agricultural Engineering Dept., Environmental Protection Agency Grant R802009-01, Program Element 1BB039, Rept. EPA-660/2-74-023, 135p., April 1974. 88 refs.*

Research concerning the identification and management of odors from livestock production is reviewed. The odorous compounds are principally low molecular weight compounds released during anaerobic decomposition of manure. Approximately 45 such odorous compounds are presently identified, with amines, mercaptans, organic acids, and heterocyclic nitrogen compounds being regarded as the principle constituents of odors. Techniques for odor control include: site selection away from populated areas and where adequate drainage exists, the maintenance of animal areas in as dry a condition as possible, the selection of manure handling systems which utilize aerobic environments for manure storage, the maintenance of an orderly operation free of accumulated manure and runoff water, and prompt disposal of dead animals, and the use of odor control chemicals when short term odor control is necessary.

47534 **APTIC NO. 69187**

Miura, Mitsugu

GAS ABSORPTION APPARATUS. *(Gasu kyushu sochi). Text in Japanese. (Miura Engineering International Co., Osaka (Japan)) Japan. Pat. Sho 49-37227. 3p., Oct. 7, 1974. (Appl. July 18, 1969, 1 claim).*

The high rate gas absorption apparatus described here is made of many concentric circle cylinders with vertical slits. The central cylinder extends higher into an outer cylinder, which is a separation chamber. Polluted gas is supplied into the largest cylinder with slits at high speed. There are liquid supply nozzles on the inner and outer walls and liquid films are atomized and effectively create gas-liquid contacts as treatment gas enters cylinders at the speed of 15-25 m/sec. The gas current swirls around the cylinder and enters into another concentric cylinder through the liquid covered slit, atomizing the liquid film. This motion is repeated as gas moves into the inner cylinder. Since the gas speed is maintained at 15-25 m/sec at all times, gas rises as much as possible in the final and the innermost cylinder. Liquid also rises with the movement of the gas. The gas-liquid mixture escapes from this cylinder through the slit into the separation chamber. The absorbent liquid is separated from gas by the centrifugal power of the current and falls into the receptacle at the top of lower cylinders. Liquid is led into a recovery tank through pipes.

47535 **APTIC NO. 69189**

Miura, Mitsugu

GAS ABSORPTION APPARATUS. *(Gasu no kyushu sochi). Text in Japanese. (Miura Engineering International Co., Osaka (Japan)) Japan. Pat. Sho 49-37226. 5p., Oct. 7, 1974. (Appl. March 31, 1969, 1 claim).*

This invention is applicable to any absorption apparatus treating trace sulfur dioxide gas, bad odor, or micro-particle dusts. The apparatus is basically composed of segmented outer and inner cylinders. The inner cylinder has many vertical slits. The treatment gas enters into the outer cylinder (the lowest segment) and is forced into the inner cylinder through the slits at the high speed of 20-30 m/sec. Liquid is sprayed onto the moving gas from the nozzles installed on the inner wall of the outer cylinder and forms liquid film around the wall of the cylinder. The liquid film is constantly atomized by the moving gas, creating effective air-liquid contacts. Atomized liquid collides onto the inner wall of the cylinder. The segmented chambers of the outer and inner cylinders are staggered so that the atomized liquid-air mixture slowly rises by in and out action through the slits of the inner cylinder. If the speed of moving gas is maintained above 10 m/sec, the liquid and gas will constantly move upward. By the time gas reaches the top chamber, pollutants in the gas are completely absorbed by liquid. At last, the gas- liquid mixture exits from the top inner cylinder into the separation chamber. The diameter of this separation chamber is large and the speed of the moving gas drops suddenly. Liquid is easily separated from gas, and falls into the receptacle in the top chamber of the outer cylinder. The liquid is emitted through a pipe into a recovery system.

47536 **APTIC NO. 69710**

Miura, Mitsugu

BAD ODOR CONTROL BY SCRUBBING (ABSORPTION). *(Senjoho (Kyushuho) ni yoru akushu boshiho). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan), and Japan Burner Research Assoc., Osaka (Japan), 6p., 1974. (Presented at the Seminar on Bad Odor Control Techniques, 2nd, Osaka, Japan Aug. 1, 1974.)*

A stack gas desulfurization system on the experimental basis can desulfurize sulfur dioxide up to 100%, but in an actual industrial scrubber, the rate is only 98 or 97%, and sometimes as low as 95%, depending on the rate of gas-liquid contact. A scrubber deodorization system can also be based on the air-liquid contact reaction, but in this case, a 95% elimination of nitrogen oxide is not sufficient. Hydrogen sulfide and ammonia emissions from an excretion treatment tank of 200-300 ppm and 10-60 ppm, respectively, can be eliminated simply. But in a sewage treatment plant, the degree of H2S is 0.0005 ppm methyl sulfide is 0.04 ppm, and ammonia is 0.07 ppm; therefore a high performance deodorization system is required. The bluebird and the ski scrubber, both based on the principle of a venturi scrubber, are explained with illustrations. For the treatment of low concentration odors, a two-step scrubbing using Blue Bird and Ski Scrubbers can be extremely effective. The Blue Bird is a cylindrical tower containing a scrubber with many vertical slits; odors enter at the speed of 20 m/sec and rise inside the swirling cylinder. The liquid at the bottom of the cylinder is drawn by the ascending gas and rises along the wall of the cylinder. The liquid film is sprayed by the high speed gas, and gas is scrubbed by the liquid. The Ski Scrubber is made of many layers of thin stainless plates with round indentations paralleling in an inclined flue. From the top of the system, liquidicontaining gas is blown down into the inclined flue, where some of the liquid is caught in the cups. But the liquid is immediately blown and sprayed. This is repeated eight times, and the liquid-gas contact is achieved eight times.

47537 **APTIC NO. 69708**

Miyamae, Shoichi

EXHAUST CONTROL APPARATUS FOR COMPRESSION IGNITION ENGINES. *(Asshuku tenka kikan no haien seigyo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho. 49-38773. 7p., Oct. 21, 1974. 1 ref. (Appl. Jan. 23, 1969, 1 claim).*

Black smoke emission from RSVD-type jet pump engine (e.g., diesel engine) is regulated when the exhaust concentration exceeds a predetermined level. When excess black smoke concentration occurs, electric signals activate the amplification apparatus, selection circuit, switching circuit, and relay equipment. The amount of fuel supplied to the fuel injection pump is reduced until black smoke emission is controlled. When a satisfactory level is reached, the control equipment stops functioning. An iron core is installed in the governor mechanism of the injection pump, and the motion of this core activates a solenoid-type electromagnetic mechanism which regulates the black smoke emission.

47538 **APTIC NO. 67195**

Morikawa, Shigeru, Takashi Watanabe, Kazumasa Takahashi, and Satoru Kurita

STUDY ON NOX REMOVAL BY OZONE OXIDATION-SCRUBBING PROCESS. *(Chisso sankabutsu no ozon sanka kyushuho ni kansuru kenkyu). Text in Japanese. Ishikawajima, Harima Giho (Ishikawajima-Harima Eng. Rev.), 14(4):389-394, July 1974. 5 refs.*

Scrubbing processes for the removal of nitrogen oxides from flue gas were examined for the following reagents: ozone-sodium sulfite, an aqueous solution of diammonium carbonyl ((NH2)2CO), and an iron sulfate-sodium sulfite catalyst. The redox reaction rate for the O3-Na2SO3 system was much faster than either of the other two systems, with the NOx being completely removed from the flue gas. Ozone consumption in the O3-Na2SO3 system was approximately 0.5 mole to 1 mole of flue gas nitric oxide. Sulfur dioxide and water in the gas did not interfere with the reaction, and Na2SO3 was synthetically produced from the SO2 in the gas stream. The redox reaction of the O3-Na2SO3 system showed promising potential for the control of both SOx and NOx emissions.

47539 **APTIC NO. 70256**

Morimoto, R.

POINTS OF INTEREST ON THE GASIFICATION DESULFURIZATION PROCESS FOR HEAVY OIL. *(Jushitsuyu gasuka datsuryu prosesu no mondaiten). Text in Japanese. Kagaku Sochi (Plant Process), 16(12):11-20, Dec. 1974. 19 refs.*

The production of low-sulfur fuel gas by gasification, desulfurization, and purification of high sulfur heavy residual oil is described. The cost of the process which uses partial oxidation is compared with the cost of direct desulfurization. Exhaust control of nitrogen and nitrogen oxides, by-product recovery, fuel resources, and the technological state-of-the art of fuel oil gasification are discussed. Examples are given from the Japanese petroleum industry.

47540 **APTIC NO. 69188**

Morita, Tomijiro

HIGH ABSORPTION RATE TREATMENT METHOD OF DILUTE SULFUR DIOXIDE. *(Kihaku aryusan gasu o kokyushuritsu de shori suru hoho). Text in Japanese. (Kureha Chemical Industries, Co., Tokyo (Japan)) Japan. Pat. Sho 49-37709. 7p., Oct. 11, 1974. (Appl. Dec. 14, 1970, 1 claim).*

A new method whereby dilute sulfur dioxide gas is treated by alkali metal or alkali metal hydroxide, carbonate, or bicarbonate is described. In the first absorption process, SO2 is selectively absorbed by a solution of sulfite and bisulfite mixture. Part of the absorbent is circulated to the second process. In the second process, alkali metal or alkali metal hydroxide and carbonate or bicarbonate are added to the absorbent from the first process and crystals of sulfite are formed. The absorbent of the second process is part of absorbent from the first process after crystals are separated by excess alkaline liquid and filtered. This liquid absorbs the remaining SO2 from the first process and the absorbent is immediately returned to the first absorption process. This is so effective that gas containing 1500 ppm of SO2 at the entrance of the first process comes out with 10-23 ppm of SO2 after the second process. The absorption rate ranges from 97.7 to 99.4%.

47541 **APTIC NO. 69289**

Moriya, Hisanori

EXHAUST GAS PURIFICATION DEVICE. *(Haiki gasu joka sochi). Text in Japanese. (Hitachi Seisakusho K. K. (Japan)) Japan. Pat. Sho 49-37694. 2p., Oct. 1974. (Appl. June 26, 1968, 1 claim).*

The concentration of toxic gases in automotive exhaust gas reaches the highest values during deceleration, when the throttle valve of the carburetor is closed to the position for idling and the negative pressure in the inlet pipe is -550 to 630 mm Hg. To reduce toxic gas concentration by improving the combustibility during deceleration, the opening structure of the throttle valve during deceleration was modified. An exhaust gas cleansing device was designed to increase the throttle opening or inject supplementary fuel-air mixture by by-passing the throttle valve during the deceleration, and simultaneously to delay ignition timing. The mechanism for injecting supplementary fuel-air mixture is controlled by a negative pressure chamber with diaphragms which operate by the difference in inlet pipe negative pressure and atmospheric pressure.

47542 **APTIC NO. 69307**

Muermann, Herbert

EQUIPMENT FOR THE SOLUTION OF DUST EMISSION PROBLEMS IN SMALL AND MEDIUM-SIZED PLANTS. *(Geraete zur Loesung von Entstaubungsprolemen in Klein-und Mittelbetrieben). Text in German. Wasser Luft Betrieb, 18(5/6):297-301, 1974.*

A dust collector comprises a ventilator, the collector, the pipe lines and the exhaust hoods. The most important task of a dust collection system is the most complete exhaustion of all dust at the point of origin. The inlet to the exhaust hood should be as close to the point of dust development as possible because with increasing distance the required air quantity for drawing off all dust increases and the system s operation becomes uneconomical. In many cases it will be best to encapsulate the entire source and maintain a slight underpressure. The selection of the air quantity for drawing off the dust-laden air is based on experience and empirical formulae derived from systematic studies. For funnel-shaped and slotted exhaust hoods the formulae are shown in graphs. At floor or table installation the required quantity of air drops to 75 percent of the quantity needed for hoods suspended from the ceiling. Illustrations of a suction hood on a large machine for milling castings and of a suction hood on a polishing frame are given. For dust collection mostly cloth filters are used. Design and cleaning devices for such filters are reviewed. A wet dust collector is illustrated. The dust-laden air enters tangentially and spirals down to the water-filled sludge tank. Through special conduction of the air a water vortex is produced through which intense contact between water and air is achieved. In a following centrifugal water separator the two phases are separated again and the water is returned to the sludge tank. Dust removal devices in a polishing shop and on two automatic machines for finishing castings are illustrated.

47543 **APTIC NO. 65824**

Munte, Hans Herbert

TRENDS OF DEVELOPMENT TO 1985 IN THE GERMAN INDUSTRY MANUFACTURING TIN WRAPPINGS (II). *(Entwicklungstendenzen der deutschen Feinstblechpackungsindustrie bis 1985 (II)). Text in German. Verpackungs Rundschau, 25(4):296-297, 1974. 12 refs.*

Trends of development and ecological problems in the German tinplate packaging industry are outlined. Waste gases generated during surface finishing and compounding operations and currently cleaned by thermal afterburning coupled with heat recovery, a process which is becoming increasingly uneconomical due to the rising costs. In a new process, lacquered and printed tinplate packagings are dried by UV rays which generates no air pollution at all. The problem of air pollution due to solvent vapors is eliminated by the powder lacquering process developed in the U. S.

47544 **APTIC NO. 69706**

Murakami Keiichi, Hiroshi Hoshi, Michio Hirawawa, and Rinnosuke Suzuki

HEXAGONAL CALCIUM SULFITE PREPARATION METHOD. *(Ropposhokei chujo aryusan karushiumu no seizoho). Text in Japanese. (Raion Yushi K. K. (Japan)) Japan. Pat. Sho 49-40359. 8p., Nov. 1, 1974. (Appl. Dec. 26, 1970, 1 claim).*

A production method for calcium sulfite from sulfur dioxide in exhaust gas is described. The macro-sized hexahedral columnar crystals of CaSO3 produced are suitable as a filler for thermoplastic resins. The SO2 gas is reacted with a suspension of calcium hydroxide, a mixture of Ca(OH)2 and calcium carbonate, or a mixture of Ca(OH)2, CaCO3, and CaSO3 in more than two catalytic reactors such as a venturi scrubber or spray tower connected in series. The SO2 gas is injected continuously to the first catalytic reactor of the series, while the liquid suspension is injected continuously to the last catalytic reactor of the series in a countercurrent. The first catalytic reactor is maintained at pH 3-6 and temperature 50-100 C, while the reaction conditions in the second and other reactors are maintained at pH above six and temperature 50-100 C. This method can be applied efficiently to exhaust gas with SO2 concentrations of less than 1%.

47545 **APTIC NO. 67043**

Murray, F. E., L. G. Tench, J. J. Asfar, and J. E. Burkell

STUDIES ON THE OXIDATION OF SULFIDES IN BLACK LIQUOR USING MOLECULAR OXYGEN. *AIChE Symp. Ser., 69(133):102-105, Jan. 1974. 11 refs.*

The oxidation of sodium sulfide in kraft black liquor proceeds more rapidly and with minimum energy consumption under conditions of highly efficient gas-liquid contacting. In design practice, this fact must be reconciled with problems of reversion of oxidized sulfide and the formation of unmanageable amounts of foam. Experiments were conducted on the oxidation of kraft weak black liquor using molecular oxygen in a small stirred-tank reactor. The effects of temperature and oxygen pressure were studied in the oxidation of sodium sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. The effects of agitation rate and power input were studied on the oxidation rates of sodium sulfide and oxygen consumption. Dimethyl sulfide was formed as an oxidation product when black liquor was oxidized. Since the oxidation of organic sulfides was strongly dependent on time and temperature, the chemical reaction rate exerted a strong influence on the overall oxidation rate. At a temperature of 140 C, oxidation of all the organic sulfides in the black liquor sample was completed in less than 10 min. It would appear quite feasible from technical considerations to oxidize all of the bivalent sulfur compounds in black liquor. (Author abstract modified)

47546 **APTIC NO. 69236**

Muto, Nobuo

BAD ODOR PROBLEMS BY LIWUID WASTE AND CONTROL METHODS. *(Haisui no akushu mondai to sono taio. Text in Japanese. Preprint, p. 14-39, 1974. 17 refs. (Presented at the Bad Odor Pollution Control Seminar, 2nd, Tokyo, Japan, July 23-24, 1974.)*

Diffusion of odors from water depends on vapor pressures, volatilities, hydrophilicities of the substances, water temperatures, water movement, atmospheric temperature, wind velocity, atmospheric pressure, and water surface area. The fife substances included in the odor control law are ammonia, trimethylamine, hydrogen sulfide, methyl mercaptan, and methyl sulfide. Deodorization of water is generally more difficult than that of gas due to various affecting factors such as the pH value. It is usually carried out by adjusting pH of the water, using strong oxidizing agents such as chlorine, chlorine dioxide, ozone, potassium permanganate and nitrogen oxides, electrolytic oxidation, coagulation-precipitation, or by biological treatment such as the diffusion of the above five substances from water at different temperature by static and stirring methods. Results showed that the water surface was still or nearly still. The diffusion was found more extensive at high temperature and strong water movement. The diffusion of ammonia and trimethylamine were strongly effected by the pH of the water while no such effect was found on methyl sulfide.

47547 **APTIC NO. 69723**

Nagano, Tadashi

POLLUTANT EMISSION CONTROL METHOD FOR THE KRAFT PULP INDUSTRY. *(Kurafuto parupu kogyo ni okeru kogaigen haishutsu boshiho). Text in Japanese. (Toyo Pulp Co. Ltd. (Japan)) Japan. Pat. Sho 49-30841. 2p., Aug. 16, 1974. (Appl. Oct. 30, 1970, 1 claim).*

A method for the production of activated carbon from bark, wood powder, and Glauber s salt is described. Barks and wood powder from a kraft pulp factory were mixed with waste liquid from a chlorine dioxide generator, or with sodium bisulfate prepared by adding concentrated sulfuric acid to Glauber s salt. The mixture was heated to form activated carbon. The method eliminates the pollutions of wood dust and Glauber s salt powder from the kraft pulp plant and the activated carbon can be used for gas deodorization and waste water treatment. A by-product sodium sulfide can be used in pulp digesting. Approximately 2 to 3 tons of activated carbon can be produced from 14 tons of barks and wood powder.

47548 **APTIC NO. 69883**

Nagata, Kyoichi, Harutoki Nakamura, Jun Yagi, Yoshiharu Maezawa, and Masayuki Wakamiya

NEW AUTOMOBILE EXHAUST GAS CONTROL CATALYST SUPPORTED ON SILICA- CLOTH. *(Shirika kurosu o tantaito suru jidosha haigasu jokayo shokubai). Text in Japanese. Nat. Tech. Rep. (Matsushita Electr. Ind. Co., Osaka), 20(5):570-579, Oct. 1974. 24 refs.*

New catalysts must be developed for use in automobile catalytic converters. Silica fiber was investigated for a silica cloth-supported catalyst, since silica is able to withstand mechanical vibration and thermal shock because of its flexibility and thermal stability. The preparation and mechanical strength of the catalyst are described, and its ability to oxidize carbon monoxide, hydrocarbons, and a mixed gas of CO and HC is reviewed. An application to an automobile exhaust gas control system is presented. The catalyst gives excellent efficiency as an automobile exhaust gas control catalyst. Because of its unique properties and characteristics, the catalyst will be useful in new ways for pollution control.

47549 **APTIC NO. 69852**

Nakagawa, Kazuo, Akira Ishizuya, and Kiyoshi Miyagi

ENGINE EXHAUST RECOMBUSTION DEVICE. *(Enzin no haiki sainensho sochi). Text in Japanese. (Honda Giken*

Kogyo KK, Tokyo (Japan)) Japan. Pat. Sho 49-41203. 2p., Nov. 7, 1974. (Appl. Oct. 18, 1971, 1 claim).

Exhaust recombustion device is designed so that recycled exhaust bypasses the secondary combustion chamber where ignition occurs, and is fed directly into the primary combustion chamber. Engine misfire and malfunction due to dilution by exhaust at time of ignition is avoided, while formation of nitrogen oxides is checked. Diagram of engine with attachment is included.

47550 **APTIC NO. 69742**

Nakajima, Yasuo, Yoshimasa Hayashi, and Kunihiko Sugihara

EXHAUST PURIFICATION METHOD AND APPARATUS FOR AUTOMOBILE ENGINES. *(Jidoshayo enjin no haiki joka hoho oyobi sono sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 49-33289. 7p., Sept. 6, 1974. 3 refs. (Appl. Sept. 8, 1969, 2 claims).*

Engine exhaust purification can be achieved by adjustments in the timing of the opening and closing of intake and exhaust valves while the automobile is running. The design of an apparatus for this purpose described. Two different cams on one stem are used to change the timing of operation and the lift of the air intake valve. By also changing the timing of the exhaust valve operation, a high-temperature, high-pressure explosive gas mixture is formed in the cylinder. Because of presence of sufficient oxygen, carbon monoxide and hydrocarbons are oxidized in the cylinder to innocuous products before emission.

47551 **APTIC NO. 69228**

Nakashima, Kazuo

BAD ODOR ELIMINATION BY CATALYTIC COMBUSTION. *(Shokubai nenshoho ni yoru akushu jokyo). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):809, Aug. 1974.*

A catalytic combustion apparatus is discussed consisting of a catalytic element, preheating burner, heat exchanger, and a thermocouple. The catalytic element is prepared by covering a nickel-supported platinum catalyst with a metal net and framing it with stainless steel. The catalytic element is mechanically strong, high in electrical conductivity, but low in thermal capacity. The upper temperature limit of the catalyst is 650 C and the upper concentration limit of the combustible substances is 15 g/N cu m for an exhaust gas having a temperature of 350 C. A high concentration gas must be diluted with air before introducing it into the combustion chamber. The catalyst is easily poisoned by mercury, lead, tin, and zinc vapors, and the catalytic potential is reduced by halogen gases. Examples showed that more than 98% of ammonia and methyl mercaptan, and more than 99% of hydrogen sulfide were removed when used for the deodorization of a gas containing 54 ppm NH3, 6.7 ppm CH3SH, and 280 ppm H2S.

47552 **APTIC NO. 69704**

Nakatsuji, S. and Teruo Shimizu

GAS WASHING DEVICE. *(Gasu senjo sochi). Text in Japanese. (Daiwa Boseki K. K. (Japan)) Japan. Pat. Sho 49-39229. 4p., Oct. 28, 1974. (Appl. March 16, 1971, 1 claim).*

A washing device for exhaust gas is described. In the washing tower with an exhaust gas inlet located at the bottom, a washing liquid spraying pipe located at the top of the tower, and a gas- liquid separator placed over the spraying pipe, a number of corrugated boards with protrusions on each convex area are placed vertically forming passage ways for exhaust gas. The protrusions on the corrugated boards facilitate the splashing of washing liquid for efficient washings. This device can be used for exhaust gas washing without specific restrictions. The characteristics of this device are its high efficiency and low construction and running costs.

47553 **APTIC NO. 69695**

Nakayama, Jinro, Takahiko Sakabe, and Masao Ogami

DUST COLLECTOR. *(Shujinki). Text in Japanese. (Nippon Nyumaehiku Kogyo K. K. (Japan)) Japan. Pat. Sho 49-38628. 2p., Oct. 23, 1974. (Appl. Feb. 10, 1971, 1 claim).*

A centrifugal dust collector was modified so that the gas containing dusts was passed through the centrifugal main body twice for the purpose of separating micro-particles which could not be separated by the existing dust collector. The tangential inlet for gas containing dust is located at the midsection of the cylindrical main body. A suction pipe with an open lower end is placed concentrically in the main body, and its upper end is connected to a blower which is connected to the tangential inlet located near the top of the cylindrical main body. The circular gas outlet conduit leading to the gas outlet is located on the outer circumference of the upper section of the suction pipe. At the lower end of the gas outlet conduit a circular plate with multiple guide blades is placed. In this system, the gas injected from the lower tangential inlet forming a vortex flow is led into the suction pipe and to the blower after the separation of micro-particles, and injected once again from the upper tangential inlet forming a vortex flow for the separation of micro-particles, which is subsequently led into the circular gas outlet conduit by the action of guide blades.

47554 **APTIC NO. 69707**

Nishimoto, Korehiko, Naruo Yokoyama, and Kazunori Masai

HYDRODESULFURIZATION OF HIGH BOILING HYDROCARBONS. *(Kofutten tanka suiso no suisoka datsuryuho). Text in Japanese. (Mitsubishi Heavy Industries, KK, Tokyo (Japan)) Japan. Pat. Sho 49-37085. 4p., Oct. 5, 1974. 1 ref. (Appl. May 27, 1968, 1 claim).*

An improved hydrodesulfurization method is described for low pressure petroleum gas and heavy oil distillate residues containing nitrogen, sulfur, and asphalt matter. By addition of appropriate saturated hydrocarbons (paraffins, cycloalkanes, alkyl cycloalkanes) during the hydrodesulfurization treatment, an improved percentage of desulfurization and dentrification resulted. Hydrodesulfurization conditions were ameliorated so that catalyst life was prolonged, the need for excess hydrogen was decreased, and cracking of high molecular weight compounds to form low-boiling hydrocarbons was minimized.

47555 **APTIC NO. 69724**

Nishioka, Akihito

DEODORIZATION DEVICE FOR REFUSE COMPACTORS. *(Kuzu asshukuki no dasshu sochi). Text in Japanese. (Sharp Co. (Japan)) Japan. Pat. Sho 49-19667. 2p., May 25, 1974. (Appl. Sept. 28, 1970, 1 claim).*

An invention for the prevention of bad odor from kitchen refuse in a compactor is described. The device has the following characteristics: a compactor with a screw-presser; a cam plate located at the upper center part of the refuse container and an inverted element which moves vertically in accordance with the cam plate; an inverted element flange and an inverted element supporter; and a spray filled with deodorizing agent and a spray supporter fixed to the wall of the compactor. When the refuse container is removed or replaced, the cam plate pushes the roller of the inverted element, and causes the element to move upward. The spray was pressed by the element and deodorizing agent was released. The spray can be replaced after used.

47556 **APTIC NO. 69697**

Nobuoka, Kunihiko and Masahiro Takiguchi

WASTE OIL AND WASTE GAS TREATMENT DEVICE. *(Haiyu, haigasu shori sochi). Text in Japanese. (Ishikawajima Harima Jukogyo K. K. (Japan)) Japan. Pat. Sho 49-41240. 4p., Nov. 12, 1974. (Appl. July 1, 1970, 1 claim).*

A waste oil and gas treatment device was designed as a steam generator. The treatment device consists of a cylindrical combustion chamber with horizontal burners, a cylindrical radiator unit of radiator pipes with fins located on top of the combustion chamber, and a cylindrical convection unit with multiple movable heating pipe blocks located on top of the radiator unit. The steam drum where the steam and saturated water are separated is located above the convection unit and is connected to the circular inlet header and outlet header located at the indentations between the combustion chamber and radiator unit and between the radiator unit and convection unit, respectively. The inlet and outlet headers are connected with radiator pipe. In the convection unit, a steaming economizer for the partial vaporization of heated water is located. The water from the supply pump is led into heating pipes in the convection unit, heated and led into the steam drum. The water separated in the steam drum is returned to the inlet header, which is subsequently heated in the radiator pipe leading to the outlet header and to steam drum, thus circulating until vaporized. Complete combustion of waste oil and gas is achieved and maintenance is simple.

47557 **APTIC NO. 69756**

Oguchi, Yutaka and Koji Nomura

PRODUCTION METHOD FOR CONTACT HYDROGENATION CATALYST FOR PETROLEUM HYDROCARBONS INCLUDING RESIDUAL OIL. *(Joryu zanyu o fukumu sekiyukei tanka suiso no sesshoku suisoka shori shokubai no seiho). Text in Japanese. (Japan Petroleum Co. (Japan)) Japan. Pat. Sho 49-31878. 8p., Aug. 26, 1974. (Appl. June 3, 1969, 1 claim).*

The preparation of a catalyst containing hydrosols of alumina systems or silica-alumina systems is described. A sample catalyst was prepared. One liter of a saturated aluminum sulfate solution, which comprises 11.80 g Al2O3 and 28.2 g sulfur trioxide per 100 cc of the solution and has a pH of 1.4, was vigorously stirred at room temperature. Then 210 g of calcium carbonate powder was added to the solution slowly through a period of about 10 hr. The resultant hydrosols of basic aluminum sulfate in the upper layer consist of 10.54 g/100 cc Al2O3 and 10.22 g/100 cc SO3, with an SO3/Al2O3 mole ratio of 1.12, a pH of 3.68 and a density of 1.246 at 15 C. One liter of 20% sulfuric acid was stirred in the cold and 4.28 liter of a sodium silicate solution, which contained 9.17 g/100 cc and silica had an SiO2/Na2O mole ratio of 2.98, was dropped gradually. The resultant silica hydrosol had a silica concentration of 10.44 g/100 cc and a pH of 1.61. Then 0.5, 4, 8, 15, 22 g of aluminum hydroxide powder (under 10 microns) was added to a mixture of 10 cc of the silica hydrosol and 100 cc of the basic aluminum sulfate, respectively. Each mixture was stirred in a 7 liter ball mill for 20 min, and was then dropped from the top of a granulating machine filled with a mixed solvent of spindle oil and trichlorobenzene (sp. gr. 1.210 at 15 C). The hydrogels formed had a diameter of 2-4 mm. The hydrogels were washed with water in tank until the SO3/Al2O3 mole ratio became 0.63. Fresh water was added and the Ph was adjusted to 9.5-9.7 with 28% ammonia water, and the mixture was heated at 50 C for 6 hr. The hydrogels were washed with water until no sulfate ion could be detected in the washing water. Granular silica-alumina was obtained after drying at 120 C for 24 hr and heating at 550 C for 3 hr. The catalyst reduced the sulfur content of oil from 4.46 wt% to 0.59 wt% after being used for 50 hr.

47558 **APTIC NO. 70278**

Ohashi, Yukihiro, Kiyohiko Mizuno, and Hideaki Sasaya

EXHAUST GAS CLEANING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan haiki gasu joka sochi). Text in Japanese. (Nihon Denso KK Kariya City (Japan)) Japan. Pat. Sho 49-40572. 5 p., Nov. 2, 1974. 1 ref. (Appl. Feb. 20, 1969, 1 claim).*

A device to purify exhaust gases from internal combustion engines by recycling part of the exhaust into the air-intake system of the engine is described. By means of two valves, whose independent operations depend on the pressure from the engine air-intake and the pressure of the exhaust gases, exhaust gas recycling is only permitted to occur when the pressures are neither too high nor too low. Amount of exhaust gas recycled depends on the magnitudes of these pressures. Consequently, the operation of the internal combustion engine under various conditions (idling, low speed, no load, maximum load, not much exhaust formation, a great deal of exhaust formation) is minimally affected by irregularities in the amount of recycled exhaust gas.

47559 **APTIC NO. 69287**

Ohkubo, Akira

COMBUSTION DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan ni okeru nensho sochi). Text in Japanese. (Honda Giken Kogyo K. K. Japan)) Japan. Pat. Sho 49-41206. 4p., Nov. 7, 1974. (Appl. July 10, 1971, 1 claim).*

A combustor for internal combustion engines with improved ignition properties and combustion efficiency was designed. The combustion chamber consists of a main combustion chamber and an auxiliary combustion chamber with spark plug. The two chambers are connected and the fuel-air mixture in the main combustion chamber is ignited by the flame from the auxiliary combustion chamber. The fuel injection port with injection nozzle is connected to the auxiliary combustion chamber, which is protected from direct exposure to high temperature combustion gas by an auxiliary intake valve synchronized with the opening of the fuel injection valve. The air intake pipe with control valve is connected to the fuel injection port.

47560 **APTIC NO. 69715**

Okazaki, Yasuyoshi, Minoru Fushikida, and Etsuro Sekido

THE WET METHOD OF ELIMINATING HYDROGEN SULFIDE. *(Ryuka suiso shisshiki jokyo hoho). Text in Japanese. (Nissan Chemical Engineering (Japan)) Japan. Pat. Sho 49-32182. 6p., Aug. 28, 1974. 1 ref. (Appl. Dec. 11, 1969, 1 claim).*

An invention for the circulation of absorbent and chemical (catalyst) for converting hydrogen sulfide to sulfur is described. The method has the following characteristics: an absorbing tower with alkaline absorbent which absorbs hydrogen sulfide and contains chemicals in the absorbent which convert hydrogen sulfide to sulfur; an intermediate basin to which the resultant absorbent is introduced to give complete reaction; a regenerator which regenerates the absorbent and chemical with air or oxygen; and a circulation system which recycles 5% to less than 100% of the regenerated absorbent and chemicals to the intermediate basin. Two regenerating towers can be used in the regenerator, one supplying regenerated absorbent and chemicals to the absorbing tower and the other to the intermediate basin. The advantages of this invention are low cost and little deterioration of catalyst. The method is particularly effective in the case of hydrogen sulfide content of more thant 10%, gas flow rate of more than 10,000 cu m and higher pressure than atmospheric pressure.

47561 **APTIC NO. 67588**

Ose, Youki, Takahiko Sato, Shozo Morishita, and Norio Kato

COUNTERMEASURES AND PRACTICES AGAINST BAD ODORS DISCHARGED FROM LIVESTOCK INDUSTRY. *(Chikusan akushu taisaku no kangaekata to jissai). Text in Japanese. PPM (Japan), 5(10):28-37, Oct. 1974. 25 refs.*

The origin of bad odors from animal husbandry and methods of treating bad odors from feces and urine are discussed. With the increase of the amount of protein consumed as food, the production of livestock industry has increased remarkably in Japan. With this increase, the odors issued from the farms are becoming a serious problem. The odorous components in feces and urine are ammonia, amines, hydrogen sulfide, mercaptan, and volatile aliphatic acids. Feces and urine issue odorous substances when they are burned or dried. One effective method to prevent odors is to raise animals in windowless buildings. In this case noises are also closed in. Mixing of sawdusts with feces absorbs odorous substances. Covering of the floor with sawdusts is suitable for raising hens, cows, and pigs. When sawdusts are not available, the feces must be collected. Circomat and Delta Scraper, developed by Alfa-Laval AB, a Swedish corporation, are excellent for this purpose. The collected feces are used as manure, after drying. Drying is accomplished by heating or natural drying. Burning is one method of disposal.

47562 **APTIC NO. 70159**

Palma, T. V. de

DIESEL AND MOTORCYCLE EMISSION CONTROL. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 257-272. (Sept. 25-27.)*

The control of exhaust emissions from diesel engines and 2-cycle spark ignition engines of the type used in motorcycles is considered in terms of using catalytic conversion as the control method of choice. Catalytic converters are capable of greater than 90% conversion of diesel odorants and polynuclear carcinogenic compounds such as the benzopyrenes, although catalysts for this application must be more active than those for light-duty internal combustion engine applications. A self-cleaning catalyst was developed for diesel applications that removes soot deposits by periodical exposure to its threshold temperature of about 700 F, a temperature frequently attained during cruise and acceleration modes in normal truck and bus operation. Catalysts for motorcycles (high carbon monoxide and hydrocarbon emitters) must be designed with as large a bed as possible so that the heat flux is held to a minimum. Assuming an average monoxide concentration of about 5% with an inlet gas temperature of 1000 F, the addition of the sensible heat in the motorcycles exhaust to the combustion heat generated by the oxidation of carbon monoxide can generate temperatures between 2000 and 22000 F. Catalysts for both diesel and motor cycle engine applications appear cost-effective and efficient.

47563 **APTIC NO. 70151**

Panzer, Jerome and Hugh F. Shannon

EFFECTIVENESS OF MAINTENANCE IN REDUCING EMISSIONS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 79-98. 7 refs. (Sept. 25-27.)*

The Exxon Emissions Related Repair Procedure, which is based on nonloaded emission measurements, was developed by studying the effects of engine malfunctions on emissions from a fleet of 396 cars chosen to match the American vehicle population in July 1971. A second fleet of 105 cars also chosen to match the vehicle population was used to demonstrate that the combination of this repair procedure and nonloaded emission testing can be as effective in reducing emissions as more costly loaded testing. About 90% of the vehicles failed by the loaded test also failed on the idle mode. Idle adjustment alone on all rejected cars reduced carbon monoxide to about the same extent as either the Exxon Emissions Related Repair Procedure or complete tuneups; reductions in hydrocarbons were only about 60-70% of those achieved with complete tuneup or the repair procedure when idle adjustment alone was used. The hydrocarbon reduction attainable with the Exxon Emissions Related Repair Procedure was equivalent to that attainable with complete tune-up. Exxon has trained over 500 of its New Jersey service station dealers and mechanics in these procedures and is currently planning to extend training to the rest of the country.

47564 **APTIC NO. 70146**

Pence, D. T. and T. R. Thomas

NOX ABATEMENT AT NUCLEAR PROCESSING PLANTS. *Atomic Energy Commission, Div. of Operational Safety, Proc. A.E.C. Environ. Prot. Conf., 2nd, Albuquerque, N. Mex., 1974, p. 427-443. 5 refs. (April 16-19.)*

NTIS: WASH-1332(74) Volume 1; GPO

The applicability of a process using a zeolite-catalyzed ammonia reaction for nitrogen oxide abatement in nuclear processing plant effluents was studied. The efficiency for converting NOx to innocuous gases over a wide range of operating conditions, even the presence of air and high humidities was more than 99%. The process design criteria appeared to be compatible with normal off-gas treatment process requirements. (Author abstract)

47565 **APTIC NO. 67092**

Pentecost, J. L. and J. K. Cochran

LOW EXPANSION CERAMIC MATERIAL FOR CATALYSIS SUPPORTS. *Preprint, Society of Automotive Engineers, Inc., New York, 6p., 1974. 11 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740198.)*

The characteristics of cordierite-type compositions and the relationship between thermal expansion and raw materials, processing, and gross composition are examined with respect to their use in catalytic devices for reduction of automobile exhaust emissions. Other possible support materials are reviewed briefly, including mullite, zircon, beryl, spodumene, aluminum titanate, silicon nitride, and other low expansion compositions. Raw material cost, processing, and reactivity with the catalysis are discussed for these materials. (Author abstract modified)

47566 **APTIC NO. 67089**

Pfoutz, B. D. and L. L. Stewart

MATERIALS OF CONSTRUCTION FOR ELECTROSTATIC PRECIPITATORS. *Preprint, American Inst. of Chemical Engineers, New York, 14p., 1974. (Presented at the American Institute of Chemical Engineers, Annual National Meeting, 76th, Tulsa, Okla., March 10-13, 1974.)*

Materials of construction for electrostatic precipitators are discussed in relation to functional precipitator operation, corrosion, strength, life, and economics. Choice of material depends on service requirements for a specific application. Special considerations for design and materials are outlined for precipitators operating continuously at high temperatures. Various precipitator applications are discussed relative to choice of construction materials. Precipitator components discussed include the enveloping structure, discharge electrodes, collecting electrodes, and insulators. (Author abstract modified)

47567 **APTIC NO. 65722**

Pischinger, R.

EXHAUST GAS DECONTAMINATION AT DIESEL EINGINES. STATUS REPORT BY THE INSTITUTE FOR COMBUSTION ENGINES, GRAZ. *(Abgasentgiftung bein Dieselmotoren, Bericht ueber die Arbeiten der Anstalt fuer Verbrennungsmotoren, Graz.) Text in German. Oesterr. Ing. Z., 17(4):121-128, 1974. 8 refs.*

Diesel engines contribute to the traffic total emissions in Germany 100% soot, 0.1 to 0.3% carbon monoxide, 1% hydrocarbons, and 12% oxides of nitrogen. A review of the existing legislation in the United States is given, beginning with the 1970 California law demanding a progressive reduction of the diesel engine emissions until 1975. European legislation is also reviewed. The development of these pollutants in the diesel engine is reviewed. For reduction of the emissions and primarily for meeting the 1975 California limits, a six-cylinder, direct injection engine was examined. A comparison of the results obtained with the direct injection engine with those of an engine with preliminary combustion chamber showed that adjustment of the injection in conjunction with two-stage combustion is preferable to either method alone. The low hydrocarbon emission is striking. The higher soot emission with direct injection is a consequence of the higher medium pressures driven with this engine. With delayed injection, the soot emission dropped. Charging brought generally lower CO and hydrocarbon values. The emission of the oxides of nitrogen, however, increased slightly. Only cooling of the air charge also reduced the oxides of nitrogen emission. With divided combustion, a delayed injection does not have the same reducing effect for oxides of nitrogen.

47568 APTIC NO. 69676

Plonsker, L., E. B. Rifkin, M. E. Gluckstein, and J. D. Bailie

REDUCTION OF GAS TURBINE SMOKE AND PARTICULATE EMISSIONS BY A MANGANESE FUEL ADDITIVE. *Preprint, Combustion Inst., Central States Section, 14p., 1974. 16 refs. (Presented at the Combustion Institute, Central States Section Meeting, Madison, Wis., March 26-27, 1974.)*

The effects on smoke and particulate emissions of using an organo-manganese compound (methylcyclopentadienyl manganese tricarbonyl (MMT) with No. 2 fuel oil in heavy duty gas turbines were measured. Additive tests were conducted with one typical gas turbine from each of the three major U. S. manufacturers. Earlier reports that MMT substantially reduces or eliminates smoke visibility were confirmed. The additive also substantially reduced the total mass of particulate and carbon emissions. At concentrations in the range of 20-100 ppm manganese, MMT generally reduced smoke, particulate, and carbon emissions by 50 to 90%. The greatest reductions in emissions were usually observed at the higher levels of Mn concentration and at higher load conditions. (Author abstract)

47569 APTIC NO. 69337

Ponder, Wade H.

STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY FOR POWER PLANT POLLUTION CONTROL. *Preprint, 66p., 1974. 8 refs. (Presented at the Thermal Power Conference, Detroit, Mich., Oct. 4, 1974.)*

The status of flue gas desulfurization (FGD) technology for power plant pollution control is presented. Commercially available FGD systems for near term (through 1980) sulfur dioxide control are throwaway product systems: lime scrubbing, limestone scrubbing, and double alkali; and the saleable product systems: magnesium oxide scrubbing, Wellman Lord (sodium sulfite scrubbing), and catalytic oxidation. A description of each of these systems including process description, history and operating experience, advantages and disadvantages, and SO2 removal efficiencies is presented, and a performance and reliability summary is included for each system. A removal efficiency of about 75% is needed to meet the New Source Performance Standards while burning bituminous coal containing 3% sulfur. Efficiencies of 85% are sufficient to meet the SO2 emission limitations of most State Implementation Plans. Systems are operating that meet these standards. Incremental capital costs for including a FGD system in the construction of new electric generating plants range from a low of $26 to a high of $43/kw. This includes particulate control equipment. Appendices are included on operating and planned FGD systems on U. S. power plants as of Sept. 1974, selected SO2 control systems on Japanese boilers, and summary of operational experience with full scale FGD units in the U. S. and Japan.

47570 APTIC NO. 65842

Puschmann, G.

METHODS FOR ODOR CONTROL IN A KRAFT PULPING PLANT. *(Verfahren zur Beseitigung der Geruchsbelaestigung bei der Sulfatzellstoffherstellung). Text in German. Wochenbl. Papierfabr., 102(11/12):412-416, 1974.*

Possibilities of control of odors from hydrogen sulfide, methylmercaptan, and dimethylsufide in kraft pulping plants are described. The rate of formation of these malodorous substances can be reduced by lowering the sulfidity to the lowest possible limit of about 20%, by the use of pinewood instead of leaf wood, by increasing the residual alkali content in the black liquor, by oxidation of the latter, and by the use of continuously operating cookers. Once generated, malodorous sulfur compounds can be controlled after capture by different methods, e.g., by adsorption on activated carbon, in alkaline solution, oxidation with chlorine or hypochlorite, or incineration at temperatures over 800 C.

47571 APTIC NO. 68383

Reither, Karl

REDUCTION OF GASEOUS EMISSIONS BY KT GAS SCRUBBERS. *(Verminderung gasfoermiger Emissionen durch KT-Gaswaschanlagen). Text in German. Wasser Luft Betrieb, 18(10):544-549, 1974.*

KT gas scrubbers remove gaseous pollutants from gas flows by chemical absorption. They come in two kinds for horizontal and vertical gas throughput. They consist of a cylindrical casing in which star-like nozzle assemblies, one for parallel current and two for countercurrent spraying, are installed. Between the nozzle assembles the scrubber is filled with special packing material. The scrubber with all components are of thermoplastic synthetics such as polypropylene, rigid polyethylene, and rigid polyvinylchloride. Type NAH comes in eight sizes with capacities up to 36,000 cu m/hr and type NAV comes in 14 sizes up to 280,000 cu m/hr. Higher volume flows can be cleaned by the parallel connection of several scrubbers. The pressure loss is low, 15 to 70 mm water for single-stage scrubbers and 30-140 mm for two-stage scrubbers. KT gas scrubbers have been successfully used in the chemical industry, the iron metalworking industry, and glass and ceramic industry. Operating experiences with KT scrubbers in use in the chemical industry (plastics production, chlorine-alkali-electrolysis, manufacture of TV tubes) and in the iron and metallurgical industry (pickling station, galvanizing, eloxadizing and hardening stations) are described. A special version, the Fresenious -S-KT scrubber, is used for deodorizing gases. The odorous substances are absorbed in the scrubber and oxidized by ozone in aqueous solution. The ozone is injected into the liquid flow and not into the gas flow as in conventional processes. A series of tests with Fresenius -S-KT scrubber yielded reductions of the odor emissions from 90 to 99%.

47572 APTIC NO. 69965

Rinckhoff, J. B. and W. R. Parish

DOUBLE CATALYSIS SULFURIC ACID PLANTS FOR COPPER CONVERTER GAS. *Preprint, American Inst. of Chemical Engineers, New York, 11p., 1974. (Presented at the American Institute of Chemical Engineers, National Meeting, 78th, Salt Lake City, Utah, Aug. 18-21, 1974.)*

A double catalysis sulfuric acid plant for the conversion of sulfur dioxide in copper converter gas to H2SO4 is described which achieves SO2 emissions well below the 500 ppm level. As opposed to the conventional plant where the conversion of SO2 to suflur trioxide is carried out in three or four catalyst beds in series with cooling between the beds to remove the heat of reaction, the double contact catalysis plant removes a major portion of the SO3 in an intermediate absorption tower after the second stage of conversion. The balance of the gas, which is returned to the converter for the final two stages of conversion, is a very weak SO2 gas with a high oxygen/SO2 ratio. The equilibrium conditions for this gas leaving the converter are very close to 100% conversion of the total SO2 entering the converter. With steady state operation, which is not realized in practice, the overall conversion of SO2 to SO3 is greater than 99.8%. The presence of appreciable fluorine in the gas may require two scrubbing towers in series to achieve complete removal of the fluorine; this is primarily to protect the catalyst in the contact section of the acid plant. Sulfuric acid mist is removed in a purification section of the plant consisting of electrostatic mist precipitators.

47573 **APTIC NO. 66762**

Robinson, Leon and N. Wayne Green

AN IMPROVED TECHNIQUE FOR THE HYDRODESULFURIZATION OF COAL CHARS. *Preprint, Garrett Research and Development Co., Inc., La Verne, Calif., 14p., 1974 (?). 10 refs.*

Laboratory results are presented from experiments involving the hydrodesulfurization of acid-treated coal chars obtained from flash pyrolysis of coal samples. The effectiveness of the hydrodesulfurization process is significantly improved by the physical beneficiation of the parent coal and by the acid treatment of the product char. These processes are effective in the removal of iron and calcium constituents which appear to contribute to the severity of hydrogen sulfide inhibition. The acid treatment is particularly advantageous in that both the Fe and Ca contents of the char are reduced well below that of the floated coal char. The remaining ash constituents which are not removed by the coal beneficiation treatment are not affected by the acid treatment, thus minimizing the consumption of the acid. A significant reduction in the hydrogen requirement of the hydrodesulfurization process is realized by countercurrent staging. The hydrogen requirement for acid-treatment char in a countercurrent system with three stages is only 12% of that for the untreated char. Preliminary kinetics studies confirm that the acid treatment technique reduces the hydrogen sulfide inhibition effect during the desulfurization process. (Author conclusions modified)

47574 **APTIC NO. 65534**

Roe, Edward H. and James D. Patton

COKE OVEN PUSHING EMISSION CONTROL SYSTEM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-183.)*

The development of a coke oven pushing emission control system is described. There are three areas of concern in the development of pollution control for coke oven emissions, particularly during the pushing phase. They are entrapment of a large thermal mass, pick-up and transfer of hot gases, and scrubbing of gas entrained particulates. The new system includes the entrapment, pick-up, and transfer of hot gases during a typical coke oven push. Background information that led to the development of the Roe Patton Coke Oven Pushing Emission Control System is presented along with the problems that were encountered and solved during the design, construction, installation, and start-up of this pilot plant entrapment on a battery of 40 Simon Carves coke ovens. This unique entrapment structure has operated successfully since April 1972. (Author abstract modified)

47575 **APTIC NO. 70131**

Rohrmann, C. A. and H. T. Fullam

CONTROL OF SULFUR DIOXIDE EMISSIONS FROM COPPER SMELTERS: VOLUME II - HYDROGEN SULFIDE PRODUCTION FROM COPPER CONCENTRATES. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Environmental Protection Agency Contract 68-02-0025, Program Element 1AB013, ROAP 21ADC-056, Rept. EPA-650/2-74-085-b, 118p., Sept. 1974. 40 refs.*

NTIS: PB 237928/AS

Laboratory studies of a modified copper smelting process that provides for sulfur dioxide reduction and the by-product recovery of blister copper, elemental sulfur, and iron oxide without loss of precious metals are described. The process involves: the neutral roasting of pyritic copper concentrates to convert the contained iron into an acid-soluble form with some evolution of elemental sulfur, hydrochloric acid leaching of the roasted concentrate to dissolve the iron with simultaneous hydrogen sulfide generation and production of enriched copper sulfide residue, the conversion of the copper sulfide residue to blister copper by conventional means, the reduction of suflur dioxide formed in the converting step to elemental sulfur with hydrogen sulfide from the leaching step, and the processing of iron chloride leach solution to regenerate hydrochloric acid and to yield a marketable iron oxide. The digestion step appears to be the only part of the scheme which is not a state-of-the-art process. Principal advantages of the process are: hydrogen sulfide production without requiring the utilization of a specific chemical reductant, elimination of costly reverberatory furnaces, dilute sulfur dioxide flue gas releases and concurrent formation of massive amounts of high-temperature solid wastes, reductions in the requirements for slag-forming minerals, and a probable increased overall recovery of copper and precious metals from a specific ore body. Further laboratory studies are recommended in preparation for pilot plant investigations.

47576 **APTIC NO. 69272**

Romero, Carlos V.

ANTI-SMOG DEVICE - FILTRATION MECHANISM. *(Assignee not given.) U. S. Pat. 3,803,812. 5p., April 16, 1974. 3 refs. (Appl. Oct. 5, 1972, 13 claims).*

An anti-smog device for filtering particulate-laden gases is described which provides mechanical filtration in conjunction with particulate collection in solution containing tanks. The gases to be treated are passed through a chemical solution for separation of the particulates, with the remaining exhaust gases being recirculated for further particulate separation before being exhausted to the atmosphere. The impregnated solution is passed through a mechanical filtration tank for removal of particulates therefrom. The exhaust gases are further purified by delivery into a second solution containing tank for removal of more particulates into solution. The remaining gas is exhausted to the atmosphere. The impregnated solution is circulated through a mechanical filter and drain, and a replenishing solution is pumped into the tank at the same time. (Author abstract modified)

47577 **APTIC NO. 69273**

Rosenberg, David J.

LIQUID-GAS SEPARATOR AND FILTER. *(Pall Corp., Glen Cove, N. Y.) U. S. Pat. 3,803,810. 9p., April 16, 1974. 2 refs. (Appl June 14, 1972, 15 claims).*

A liquid-gas separator and filter is described that is capable of separating and venting gases from liquids in any position of the filter, thus avoiding gas block buildup in the system. The device is based on a combination of three filters, arranged side- by-side in alternate sequence. At least one filter is wetted by the liquid, and at least one is liquid-repellent; the liquid-wetted filter passes only the liquid, and the liquid-repellent filter passes only the gas. By employing three filters side-by-side in alternate sequence, with two like filters on each side of the unlike filter of the three, the device is made position- insensitive with respect to gas removal. (Author abstract modified)

47578 **APTIC NO. 69535**

Salmon, Royes and J. P. Nichols

STUDY OF OPTIONS FOR CONTROL OF EMISSIONS FROM AN EXISTING COAL- FIRED ELECTRIC POWER STATION. *Preprint, Atomic Energy Commission, Washington, D. C., 25p., 1974. 6 refs. (Presented at the Atomic Energy Commission Pollution Control Conference, 2nd, Albuquerque, N. Mex., April 16-19, 1974.)*

NTIS: Conf-740406-1

Alternatives for the reduction of sulfur oxide emissions from an existing 1300 MW coal-fired power plant are compared with respect to technological feasibility, practicality, and cost. The principal options available for near-term (1975-1977) application are the use of low-sulfur fuel oil derived from petroleum or low-sulfur western coal. The use of low-sulfur continued scarcity, high price, and unreliability of supply. Operational problems with low-sulfur coal may cause de-rating of plants designed for eastern coals. Stack gas treatment processes such as scrubbing with limestone slurry do not yet have the degree of operating reliability needed for power plant use. Processes for treating stack gas may achieve 90% reliability by about 1976, but implementation by 1977 would require selection of a process and initiation of engineering by about 1974-1975. Among the longer-term options, low-Btu gas has the advantage of a high degree of sulfur removal and the potential for future use in cycles of high efficiency. Low-Btu gas is produced by gasifying coal with air or steam. Solvent-refined coal appears to have considerable potential, assuming that pilot plants are successful. Liquid fuels from coal have promise not only for power plant use, but also for easing the long-term shortage of liquid fuels for the transportation sector. Costs for the various control strategy are cited. (Author abstract modified)

47579 **APTIC NO. 69891**

Saponja, W.

A SYSTEMATIC APPROACH TO THE APPLICATION OF ELECTROSTATIC PRECIPITATORS ON LOW SULPHUR COALS. *Preprint, Canadian Electrical Assoc., 30p., 1974. (Presented at the Canadian Electrical Association Thermal and Nuclear Power Section, Edmonton, Alberta, Oct. 9, 1974.)*

Pilot plant field tests were conducted on the fly ash removal capabilities of two identical electrostatic precipitators installed at two coal-fired steam plants using low ranked sub-bituminous coal with an average sulfur content of 0.2-0.23%. At one of the plants, fly ash was readily precipitated with the electrostatic pilot operation, while at the other plant highly resistive fly ash resulted in a serious reduction of effective migration velocity. Flue gas conditioning with sulfur trioxide (just upstream of the pilot precipitator) at the latter plant enhanced the precipitation characteristics of the fly ash particles, and relatively stable electrical conditions were still evident a day after injection had ceased. A sulfur trioxide concentration of 20-25 ppm by volume was adequate. Hot side testing was performed to evaluate the proposed installation of hot precipitators at the second plant location. A reasonable range for effective migration velocity for a full scale precipitator is 0.30 to 0.37 ft/sec. High resistivity and back-corona are encountered at temperatures under about 600 F. Sodium conditioning of the high resistance coal used at one location also reduced resistivity but was not economically competitive with gas conditioning.

47580 **APTIC NO. 69290**

Sato, Hideya

EXHAUST PURIFICATION DEVICE FOR ROTARY PISTON ENGINE. *(Rotari pisuton enjin no haiki joka sochi). Text in Japanese. (Tohyoh Kogyo K. K. (Japan)) Japan. Pat. Sho 49-37687. 2p., Oct. 16, 1974. (Appl. Nov. 9, 1966, 1 claim).*

In the rotary piston engine with casing consisting of center housing and two parallel side housings, in which the intake, compression, explosion, expansion and exhaust emission processes are carried out with the planetary motion of multilateral rotor, the air inlet for injecting compressed air during the exhaust stroke is placed in the side housing. With the opening of the exhaust port as the projected part of the rotor passes the exhaust port, the combustion gas is discharged as exhaust gas and thye pressure in the chamber is reduced. When the pressure is reduced to a certain value, the air injection port is opened and compressed air is led into the chamber where it mixes with combustion gas and facilitates the oxidation of carbon monoxide and incompletely oxidized hydrocarbons, thereby reducing the CO and HC contents in exhaust gas.

47581 **APTIC NO. 67239**

Schmidt-Burbach, Gerhard, Anton L. Jung, Helmut Hubert, Manfred Lapczyna, Erhard Ledwon, Wilfried Rock, and Heinz Strauss

AIR FILTER WITH ELECTROSTATIC PARTICLE COLLECTION. *(Buderus sche Eisenwerke, Wetzlar (Germany)) U. S. Pat. 3,798,879. 5p., March 26, 1974. 14 refs. (Appl. Nov. 29, 1971, 4 claims).*

An air filter with an electrostatic particle collector is described which overcomes prior art disadvantages of electrostatic precipitators associated with electrode contamination and particle dislodgement and escape. The present invention, in contrast to prior art systems in which the collector electrodes are constituted by arrays of rods, wires, or bars parallel to the directioon of fluid flow, provides a mechanical entrapment filter directly across and at right angles to the path of the gases. The filter layer is additionally composed of electrically conductive filaments or at least filaments, fibers, or strands of such conductivity that the electrostatic particle collecting potential can be applied across this electrode-filter element and a counterelectrode spaced therefrom in the direction of the gas flow. This arrangement prevents particles which are gathered in the layer from being entrained by gas even after the particle has lost its charge.

47582 **APTIC NO. 65635**

Schmidt, Peter

SOLID WASTE DISPOSAL BY THE FLAME CHAMBER HIGH TEMPERATURE PROCESS. *COMPLETE MINERALIZATION OF THE RESIDUES. (Abfallbeseitigung nach dem FLK-Hochtemperaturverfahren. Vollstaendige Mineralisierung der Rueckstaende). Text in German. Umwelt (Duesseldorf), 4(4):39-42, 1974. 5 refs.*

The flame chamber process for melting solid waste operates with temperatures between 1400 and 1600 C. These temperatures suffice to convert all mineral fractions of trash into molten state. The end products are sterile slag and almost dust-free completely burned out waste gases. The incinerator for this process has a cylindrical external coat with a tightly sealed bell-shaped construction suspended in it. The bell-shaped construction contains a centrally arranged ignition burner as well as a rotating internal coat. The bottom of the flame chamber is conically shaped narrowing towards the water-cooled outlet. The flame chamber is followed by another combustion chamber for the sole combustion of fluids either simultaneously with the combustion in the flame chamber of independently from it. This second combustion chamber is succeeded by an afterburning chamber with recuperative heat exchanger for utilization of the waste heat for preheating air for the combustion process. In order to obtain the necessary high combustion temperatures the process operates only with 30 to 60% excess air. Once supplied to the incinerator the crushed waste takes from 1.5 to 3 hr to reach the melting zone during which time 30 to 50% of the water from the entered waste evaporates. The gases developing in the process are forced to pass through the melt which binds all coarse particles. The lower quantity of pollutants in the waste gas requires less expensive gas cleaning facilities.

47583 **APTIC NO. 70259**

Schneider, H.

CATALYTIC AND THERMAL WASTE GAS CLEANING - FUNDAMENTALS, APPLICATION AND ECONOMY. *(Katalytische und thermische Abluftreinigung - Grundlagen, Anwendung und Wirtschaftlichkeit). Text in German. Tech. Mitt., 67(11):495-507, 1974. 5 refs. (Presented at the Seminar on Dust Collection in Industrial and Commercial Plants, Haus der Tech nik, Essen, West Germany, May 15, 1974.)*

The fundamental principles underlying the catalytic and thermal afterburning processes are reviewed. Catalytic afterburners are used presently only to a limited extent, since in rare cases the absence of catalyst-ruining substances can be guaranteed. Examples for the application of thermal afterburners for emission elimination in the coil coating, phenol processing, and food and automobile industries are given. The examples from the automobile industry demonstrate clearly the multiple possibilities of heat recovery. To give an example, the waste air from the infrared convection dryer for drying the lacquer on automobile chassis goes to a combustor and then to a heat exchanger where the air for the convective part of the dryer is preheated. After that the cleaned air, which still carries a considerable amount of heat, goes to the infrared section of the dryer so that the entire dryer is operated with cleaned waste air. With regard to costs, thermal and catalytic afterburning require approximately the same investment costs.

47584 APTIC NO. 69685

Seale, Leonard M. (ed.)

PROCEEDINGS: SYMPOSIUM ON THE USE OF FABRIC FILTERS FOR THE CONTROL OF SUBMICRON PARTICULATES. (APRIL 8-10, 1974, BOSTON, MASSACHUSETTS). *GCA Technology Div., Bedford, Mass., Environmental Protection Agency Contract 68-02-1316, Program Element 1AB012, ROAP 21ADL-34, Rept. EPA-650/2-74-043, 316p., May 1974. 123 refs.*

NTIS: PB 237629/AS

Proceedings presentations are given from a symposium aimed at describing the fine particulate control potential of existing fabric filter systems for the benefit of regulatory and user groups and suggesting to manufacturing and research organizations those areas where performance levels most need improvement. Topics covered include: the significance of particulate emissions; emission standards for particulates; performance and cost comparisons between fabric filters and alternate particulate control techniques; types of fabric filter installations; comparison of fine particle capture in fiber structures and filter cakes; optimizing filtration parameters; engineering and economic considerations in fabric filtration; collection efficiency as a function of particle size, shape, and density; some effects of electrostatic charges in fabric filtration; the design of a filter system to meet specified efficiency and emission levels; laboratory generation of particulates with emphasis on sub-micron aerosols; methods for determining particulate mass and size properties; a mobile fabric filter system; extending fabric filter capabilities; new fabrics and their potential application; new kinds of fabric filtration devices; and needed research in fabric filtration.

47585 APTIC NO. 70113

Searles, Robert A.

ODOUR AND FUME CONTROL. PART II. CLEAN AIR THROUGH CATALYSIS. *Chem. Ind. (London), no. 22:895-899, Nov 16, 1974. 14 refs. (Presented at the SCI, Chemical Engineering Group, London, England, March 12, 1974.)*

The design of catalytic oxidation systems to remove odors and solvents and of catalytic reduction systems to remove nitrogen oxides is discussed. Platinum group metals can be used to oxidize carbon monoxide and organic compounds. Many other types of catalysts are also available, such as ceramic honeycombs which can be used to remove odors from many industries. Waste solvents can be removed by thermal or catalytic incineration. The production of nitric acid by the oxidation of ammonia produces residual nitric oxide. The tail gas from the absorbers must be further treated to remove excess amounts of NO and nitrogen dioxide. Catalytic reduction can be used to remove the NO_x from the tail gas. Catalytic abatement systems can reduce the cost of producing nitric acid.

47586 APTIC NO. 69653

Shashkov, V. I., I. P. Mukhlenov, Y. Y. Ben yash, V. I. Ostanina, M. M. Shokarev, and F. I. Vershinina

EFFECT OF COPPER, ZINC AND LEAD SULFATES ON ACTIVITY OF VANADIUM CATALYST IN FLUID-BED OXIDATION OF SULFUR DIOXIDE. *(Vliyanie sul fator, medi, tsinka i svintsa na aktionost vanadievogo katalizatora pri okislenii dvuokisi sery v psevdoozhizhennom sloe). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(2):105-107, Feb. 1974. 14 refs.*

The effects of copper, zinc, and lead sulfate impurities on the activity of vanadium catalysts used in fluid-bed oxidation of sulfur dioxide to sulfuric acid were investigated by evaluating catalyst activity using its oxidation activity, the rate constant of the reaction calculated from the Boreskov equation, and a correction factor introduced to allow for the effect of mixing and passage of gas bubbles through the fluidized bed. Catalysts treated with atomized solutions of copper and zinc sulfates at 460-580 C showed decreased oxidation activities with increasing impurity contents: zinc sulfate reduced the catalyst activity more than copper sulfate. Coefficients of catalyst poisoning at 540 C were calculated as 0.017 for copper sulfate and 0.034 for zinc sulfate. Up to 30 g/cu dm of lead sulfate in the catalyst did not lower the activity in the temperature range of 460-560 C; though as the lead sulfate content increased, the catalyst activity gradually dropped as a result of clogging the catalyst pores by lead sulfate evidently. Catalyst activities are tabulated as function of copper, lead, and zinc sulfate quantities at 540 C; and graphical representations are used to illustrate the extent of oxidation of SO_2 on the catalyst as a function of impurity concentration, the extent of oxidation of SO_2 as a function of process temperature, and concentration isotherms of catalyst poisoning by zinc and copper sulfate at 540 C. Infrared spectra are presented for melts of equivalent mixtures of sulfates of zinc, copper, and lead, as well as for pure potassium sulfate.

47587 APTIC NO. 69275

Shibuya, Akira, Susumu Takayama, Yoshifumi Nitta, Kazuhiko Sendai, and Masaharu Yana

TWO-STAGE TYPE OF ELECTRIC DUST ARRESTER. *(Ishikawajima-Harima Jukogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,803,808. 8p., April 16, 1974. 15 refs. (Appl. July 2, 1973, 14 claims).*

A two-stage electrostatic dust arrester is described which is capable of achieving dust collection without inverse ionization and spark occurrences even for dusts with resistivities as high as 10 to the 11 ohm/cm. The apparatus consists of a charging stage and a collecting stage arranged in succession within a chamber defined by a casing. The charging stage includes a pair of charging electrodes spaced apart laterally of the dust flow path. The collecting stage, located downstream, includes a collecting electrode having a pocket extending along its length with an open face aligned with the space between the charging electrodes in the direction of dust movement through the chamber. A high voltage direct current source connected to the charging and collecting electrodes creates a field to accelerate dust particles as they move between the electrodes and to attract the particles into the pocket. (Author abstract modified)

47588 APTIC NO. 70083

Soderberg, Henning E.

ENVIRONMENTAL, ENERGY AND ECONOMIC CONSIDERATIONS IN PARTICULATE CONTROL. *Mining Congr. J., 60(12):24-29, Dec. 1974.*

The costs of clean air are discussed with respect to the coal industry. Because of the high operating costs of air pollution control equipment, and energy and environmental systems, choice of control methods is very important in the coal industry. Several types of dust control equipment and their performance, costs, and power requirements are reviewed.

Cyclone efficiency as a function of particle size, cloth collectors, thermal dryer pollution problems, venturi scrubbers, ways of improving collection efficiency, effects of dust loads and distributions on collection, and wet scrubbers as the practical solution for coal dryer emissions are discussed.

47589 **APTIC NO. 65177**

Sorrels, Donald E., Douglas R. Liljedahl, and Jerry L. Terry

AN INVESTIGATION OF IDLE EMISSIONS INSPECTION AND MAINTENANCE AT ALTITUDE. *Preprint, Air Pollution Control Assoc., 32p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-1.)*

A sample of 300 vehicles representing the 1964-1973 model years was used to investigate the effectiveness and feasibility of conducting an idle inspection and maintenance program in private garages. Hydrocarbon and carbon monoxide emissions could be decreased 11% and 7%, respectively, at a 40% rejection rate. A slight decrease in oxides of nitrogen and a slight increase in fuel economy were also measured. Specific conclusions with respect to idle emissions inspection and maintenance. The effectiveness curve for HC rose sharply from 0 to 30% rejection and continued to rise at a reduced rate to 60% rejection. The effectiveness curve for CO rose sharply from 0 to 30% rejection and continued to rise at a reduced rate through 60% rejection. The effectiveness curve for NOx rose gradually from 0 to 60% rejection. Inspection charges ranged from $1.50- 6.00; the average inspection charge was $4.05. The average maintenance cost per failed vehicle was $10.57. The average cost per vehicle for all vehicles was $6.14. The average combined cost for inspection and repair per failed vehicle was $10.18. The average cost overcharge per station was from $0.85 to $2.31 per failed vehicle. (Author conclusions modified)

47590 **APTIC NO. 70169**

Springer, Karl J.

CONTROL OF VISIBLE EMISSIONS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 469-476. (Sept. 25-27.)*

Measures for the control of visible emissions (smoke) from diesel-powered vehicles are reviewed. The advent of restrictions on the amount of gaseous emissions from diesels, principally nitrogen oxides, has caused some compromise between smoke and NOx reduction, since most practical NOx control methods result in an increase of visible emissions. Major improvements in visible emission reduction are achieved by various fuel injection modifications, better turbocharger matching and improved turbochargers, specifying the correct engine for a given application, proper maintenance with engine adjustments to manufacturer s specifications, and proper operation of the engine. Retrofits are available in the form of turbocharger kits and improved fuel injectors.

47591 **APTIC NO. 70164**

Stallworth, Tom

REPORT ON DALLAS CARPOOL PROGRAM. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 339-349. (Sept. 25-27.)*

The Dallas carpool program is discussed as one element of a multifaceted program of transportation control measures designed to reduce energy consumption, air pollution, and traffic congestion. More than 30,000 names are on the data base of a computer program designed to supply information necessary for arranging carpools. The most effective approach is that offering the service through employers who support the program objectives. Cost-effectiveness is excellent, and the number of people requesting the service is continuing to grow. Gasoline prices stimulate most of the interest by individuals, but employer problems with parking and congestion at employment centers also promote the program. Information collected can be used on a contigency basis if fuel supplies are reduced. Significant travel pattern data is obtained for transportation planning use. The program cannot be evaluated qualitatively yet.

47592 **APTIC NO. 70139**

Steiner, P., H. Juntgen, and K. Knoblauch

PROCESS FOR REMOVAL AND REDUCTION OF SULFUR DIOXIDES FROM POLLUTED GAS STREAMS. *Preprint, American Chemical Society, Washington, D. C., 16th, 9p., 1974. 5 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., 1974.)*

A new second generation process designed to remove sulfur dioxide from polluted gas streams is described. The front end of the process operates as an SO2 concentrator. In this part of the system the SO2 containing gases are brought in contact with a special carbon characterized by high activity towards SO2, high ignition point, and a particular hardness. Following the preferential adsorption of SO2, the special carbon adsorbent is regenerated by thermal treatment and yields a concentrated SO2 off-gas. The SO2 off-gas is converted to elemental sulfur by the new RESOX(tm) process for the reduction of SO2 in a coal bed. The process represents a new way to achieve the desired rate of reaction between SO2 and crushed coal at temperatures of approximately 1200-1400 F. All portions of the integrated Bergbau Forschung- Foster Wheeler process were extensively tested by pilot plant operations. At the present time two demonstration plants of commercial size are being constructed. (Author abstract)

47593 **APTIC NO. 69445**

Stone, Phillip L. and Charles P. Blankenship

DESIGN AND EVALUATION OF EXPERIMENTAL CERAMIC AUTOMOBILE THERMAL REACTORS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-21, Rept. E-7175, NASA-TN-D-7706, 27p., July 1974. 11 refs.*

NTIS: N74-28035

Results obtained in an exploratory study of ceramics for automobile thermal reactors are presented. Ceramic materials were evaluated in several reactor designs by using both engine dynamometer and vehicle road tests. The ceramics included silicon carbide, glass-ceramics, ALCET (aluminum and silicon nitride), and a graphite-fiber-reinforced silicon carbide. Primary support of the ceramic components in all designs was provided by a corrugated-metal structure. In dynamometer tests, peak reactor gas temperatures were 1040-1090 C for about 60% of the test time. Vehicle road tests were conducted under normal driving conditions with a peak reactor gas temperature near 980 C. Silicon carbon exhibited the best performance, lasting up to 1100 hours in dynamometer tests and 38,600 km in road tests. The 1100-hour dynamometer test was representative of the life of the test engine under the severe cyclic test conditions. In the road test, a glass-ceramic reactor survived 33,800 km and was still in good condition at the end of the program. However, the glass-ceramic reactors failed in less than 330 hours of the more severe dynamometer tests. With proper design, the glass- ceramics offer good potential for reactor use. The ALCET and graphite fiber reinforced silicon carbide reactors failed in less than 200 hours of dynamometer tests and were unstable under the imposed test conditions and were severely degraded. (Author summary modified)

47594 **APTIC NO. 69754**

Stukel, James J.

NOX EMISSIONS FROM STATIONARY COMBUSTION SOURCES. *J. Environ. Eng. Div., Am. Soc. Civ. Eng., 100(EE3):641-660, June 1974. 16 refs.*

Nitrogen oxides emissions from a stationary combustion sources and their control are discussed. Over 60% of the total

NOx emissions in the United States are from stationary sources: electric power plants, industrial combustion sources, stationary internal combustion engines used in pipelines and gas plants, domestic and commercial combustion equipment, and noncombustion sources. Gas recirculation and off-stoichiometric operating conditions offer the most promising abatement techniques. The degree to which NOx reduction will be attained cannot be predicted prior to installation. Many boiler manufacturers will guarantee 50% NOx reduction with oil- or gas-fired installation if gas recirculation methods are used. For all other methods the degree of control to be expected varies with the particular boiler under review. (Author summary modified)

47595 **APTIC NO. 69185**

Suzuk , Minoru

PRODUCTION AND SALES INFORMATION ON DUST PRECIPITATORS BY INDIVIDUAL APPARATUS. *(Shujin sochi no kishu betsu seisan jisseki). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):64, 1974.*

A survey conducted by the Japan Society of Industrial Machinery Manufacture is presented. The number of dust precipitators manufactured during 1973 was largest for filter precipitators (9967), followed by electrical precipitators (1056), scrubbers (5150), and centrifugal (309) dust precipitators, respectively. The precipitator sales growth from 1972 to 1973 was also largest for filter precipitators. The number of sales for centrifugal and scrubbing precipitators dropped from the previous year, while filter and electrical dust precipitators sales increased. The filter and electrical dust precipitators seem to be dominantly used, and will continue to be in the future.

47596 **APTIC NO. 69207**

Suzuki, Minoru

A TREND IN POLLUTION CONTROL EQUIPMENT REVEALED IN THE 1973 EQUIPMENT PRODUCTION. *(48 nendo no seisan jisseki ni miru kogai boshi sochi no keiko). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(10):20-25, Oct. 1974.*

Since 1971, a survey on the production of pollution control equipment has been conducted by sending questionnaires to industries. In 1973, 194 out of 215 industries answered the questionnaire (response rate 90.2%). Total production cost was $1850 million, which was a 30.2% increase compared to the previous year. The production classified by equipment type indicated the largest increase in exhaust gas treatment equipment (279.5% of the previous year s production) followed by exhaust gas desulfurization equipment (253.0%) and refuse incineration equipment (208.6%), while the production of marine pollution control equipment was reduced to 44.2% and the waste oil treatment equipment to 57.7%. According to classification by type of industry, the largest increase was shown by the export industry (210.5% of the previous year s production) followed by manufacturing industry (169.8%), petroleum and coal industries (162.7%), and petrochemicals (161.7%). The equipment production data were also analyzed according to the size of capital of industrial companies. The average production cost for pollution control equipment increased generally with the size of capital of companies.

47597 **APTIC NO. 70177**

Swaim, C. Donald, Jr.

THE SHELL CLAUS OFFGAS TREATING (SCOT) PROCESS. *Preprint. American Chemical Society, Washington, D. C., 22p., 1974. 4 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 4, 1974, Paper 122.)*

The Shell Claus Offgas Treating (SCOT) Process is discussed along with the operating experience of the first commerical plants to be placed on stream. Two small skidmounted units were designed and placed in operation in California with 8.5 months of contract award. The SCOT Process has functions familiar to refinery operators, economical carbon steel is used throughout, and has no waste discharges except the vent gas containing less than 500 ppm hydrogen sulfide (250 ppm Sulfur dioxide after incineration), and a clean water condensate. The process is divided into two sections, reduction-quench section, and amine section. The reduction step converts essentially all sulfur values in Claus offgas to H2S. The amine section absorbs most of the H2S from the gas while coabsorbing as little CO2 as possible.

47598 **APTIC NO. 69292**

Tagami, Koji

EXHAUST GAS RECOMBUSTION DEVICE FOR AUTOMOBILE ENGINE. *(Jidoshayo kikan no haiki gasu sainensho sochi). Text in Japanese. (Mikuni Kogyo K. K. (Japan)) Japan. Pat. Sho 49-32486. 2p., Sept. 3, 1974. (Appl. Nov. 15, 1969, 1 claim).*

For the purpose of facilitating the complete combustion of automotive exhaust gas, a recombustion device using preheated fresh air supply was designed. The recombustor consists of an outer cylinder with fresh air inlet, an inner combustion cylinder with exhaust gas inlet and outlet, and an air cylinder with a spiral air conduit placed inside of the innner combustion cylinder. The fresh air inlet of the outer cylinder and exhaust gas outlet are located at one end, while the exhaust gas inlet and preheated air inlet into the inner combustion cylinder are located at the other end. The air cylinder connected to the outer cylinder at one end is connected to the spiral air conduit at the other end, and the air conduit on the exhaust gas inlet side has several small holes for injecting air into the inner combustion cylinder. A fuel injection port for facilitating the ignition is located near the air injecting holes. The air passing through the space between outer and inner combustion cylinder, air cylinder, and air conduit is heated before injection into the inner combustion cylinder.

47599 **APTIC NO. 70251**

Takahashi, Y., H. Yamamoto, and Y. Fujima

STUDY ON EXTRA-LOW NOX GAS BURNER. *(Gasudaki chotei NOx bana no kenkyu). Text in Japanese. Nihon Kikai Gakki-shi (J. Japan. Soc. Mech. Engrs.), 77(673):10-17, Dec. 1974. 9 refs.*

A comparison was made of diffusion burning processes with premixed burning processes to discover which process is better for reduction of nitrogen oxides. Effects of air ratio and recycled gas mixture ratio on NOx concentration are larger in premixed burning processes. Test burners utilized 2 tons heavy oil/hr and 8 tons heavy oil/hr capacities. Very low NOx gas burning requires a premixed burner, operation at a high air ratio, and cool flame temperatures. Theoretical projections of very low NOx burning based on reaction velocity and thermodynamics are given.

47600 **APTIC NO. 69194**

Takashima, Hirotake and Hisamitsu Nishii

DEODORIZATION-SMOKE REMOVING APPARATUS. *(Dasshu shoen sochi). Text in Japanese. (Osaka Gas Co., Osaka (Japan)) Japan. Pat. Sho 49-38151. 4p., Oct. 15, 1974. (Appl. Nov. 30, 1970, 1 claim).*

An invention designed to increase per/volume efficiency of deodorization-combustion devices used in the coating, printing, and offset printing businesses and in refuse incineration is described. The device has a drum-type large casing which houses a slowly rotating heat exchanger at one end and a stationary combustion chamber at the other end. Inside the rotor, heat exchange is divided by many walls which separate the chamber radially. Each room is packed with nickel or white gold catalyst pellets, more densely packed on the side of the combustion room. Between the combustion room and the heat exchanger is a rotating mixing chamber where the treatment gas and combustion air are mixed. The treatment gas enters from the entrance duct, goes through the heat exchanger and enters the combustion room; after burning, the gas makes a U-turn and goes through a guide duct, through the heat exchanger packed with catalyst pellets, and out through an exit.

47601 **APTIC NO. 69193**

Tamura, Yoshisuke

COMBUSTION EXHAUST SULFUR OXIDES REMOVING METHOD AND APPARATUS. *(Nensho haigasu chu no io sankabutsu o jokyo suru hoho oyobi sochi). Text in Japanese. (Hitachi Co., Tokyo (Japan)) Japan. Pat. Sho 49-37626. 2p., Oct. 11, 1974. (Appl. Sept. 14, 1970, 1 claim).*

A method for removing sulfur oxides from flue gas by direct injection of a cooling liquid thereby freezing SOx is described. Sulfur dioxide in combustion gas begins to freeze at about -95 C, and carbon dioxide around -100 C. Combustion gas is led to a heat exchanger through a flue where the low temperature return gas cools the combustion gas. It is then sent to a cooler where the temperature drops to -90 C. The flue gas is then sent to the mixer where a liquid aerosol of -130 C is added. The SO2 freezes and the gas enters a cyclone. Frozen SO2 is separated in the cyclone and drops into a receptacle underneath. It is then sent to the SO2 recovery device. Exhaust gas is returned to the heat exchanger, heated by new combustion gas, and is emitted from the stack. When the combustion gas contains water, hydrogen condenses and freezes in the cooler, causing difficulties. Therefore when combustion gas contains H2O, instead of sending it to the cooler, liquid aerosol cool enough to freeze water is injected and then sent to the mixer, where SO2 is frozen by the -130 C liquid aerosol. The frozen H2O and SO2 are separated from cleaned gas in the cyclone.

47602 **APTIC NO. 65719**

Tanaka, Chuji, Fumio Yamaguchi, and Takao Shirakura

STUDY ON WET TYPE CYCLONE -- EFFECTS OF PARTICLE SIZE OF THE SAMPLE ON THE CYCLONE PERFORMANCE, SPECIFIC GRAVITY, SEPARATED PARTICLE SIZE. *(Shisshiki saikuron ni kansuru kenkyu -- Shiryoryudo no eikyo oyobi hiju to bunriryukei ni tsuite). Text in Japanese. Preprint, Japan Mining and Metallurgical Inst., Tokyo, p. 51-52, 1974. (Presented at the Japan Mining and Metallurgical Institute Convention, Spring Meeting, Tokyo, Japan, March 26-28, 1974, Paper 1310.)*

Effects of grain size of a given sample on performance of the cyclone including pressure loss, required drive power, collection efficiency, classification, concentration, and clearness were examined, using an experimental device consisting of a main tank, slurry pump, cyclone, overflow or underflow tank, and another main tank arranged in a closed circuit system. The input pressure was controlled by changing rpm of the pump. Six different samples of fine powder industrial coal (specific gravity, 2.72) were used. Their representative particle sizes were 38, 67, 78, 90, 10, and 190 micron respectively, each of which gave the particle size distribution index of n equal 0.51. For the test on specific gravity of the sample against the separated particle size, four different samples including fine powder of coal (S.G. 1.35), sand (2.68), lime (2.72), and of iron ore (4.81) were used. The greater the particle size, the less the pressure loss. The same thing is true of effect of the particle size on the pressure loss factor. Both the pressure loss and the pressure loss factor are more affected by the inner diameters of the nozzles. A similar trend was observed for the effects of the particle size on the required power, but not as much as for pressure loss. The collection efficiency was greater with greater particle size. The separable particle size is negligibly affected by the particle size characteristic of the feed sample, but it is apparently affected by its specific gravity. The total effect of particle size in the sample material on performance of the wet cyclone is not highly significant.

47603 **APTIC NO. 69415**

Teague, D. Maxwell, Leo B. Clougherty, and Anthony N. Speca

THE OPERATION OF PLATINUM-PALLADIUM CATALYSTS WITH LEADED GASOLINE. *Chrysler Corp., Detroit, Mich., Engineering and Research Office, 13p., May 2, 1974. 16 refs.*

Since leaded fuel inactivates a noble metal oxidation catalyst used to control hydrocarbon and carbon monoxide emissions in a motor vehicle, the Federal government has mandated the availability of unleaded fuel, containing no more than 0.05 g/gal of lead. Both catalytic and noncatalytic vehicles emit some sulfur trioxide when running on unleaded fuel; leaded fuel, however, reduces the emissions of sulfur trioxide on noncatalyst cars. A portion of lead forms inert lead sulfate with exhaust SO3. The lead sulfate is principally retained in the exhaust system, as are most lead compounds. Thus, the broad present use of leaded fuel is actually minimizing sulfate emission from present vehicles. Because of the advantages of using leaded fuel in all vehicles, leaded fuel was tested on platinum and palladium catalyst-equipped laboratory engines. The initial 10 hr of the engine dynamometer test was run with unleaded fuel to stabilize catalyst performance. The next 10 hr of operation on leaded fuel showed an abrupt loss in catalytic carbon monoxide removal from 95% to 30%. A subsequent 10 hr of operation on unleaded fuel showed a fairly rapid, but not complete, recovery of catalytic activity back to 88%. Thus, it appeared unlikely that deposition of lead compounds was the cause of activity loss. Scavengers normally added with the tetraethyl lead to make leaded fuel which typically consist of sufficient ethylene dichloride to form lead chloride with the lead present, plus half as much additional ethylene dibromide, caused severe catalyst inactivation. When leaded fuel with no scavenger was tested, there was only a small loss in activity. A series of tests determined that the ethylene dibromide part of the scavenger is the component which inactivates oxidation catalysts, not the lead. Thus, it may be possible to use a single, leaded fuel containing only ethylene dichloride and no ethylene dibromide for both catalyst and noncatalyst vehicles.

47604 **APTIC NO. 70173**

Tek, M. R., B. Williams, D. L. Katz, D. E. Briggs, E. R. Lady, J. E. Powers, and W. E. Lobo

EVALUATION OF COAL CONVERSION PROCESSES TO PROVIDE CLEAN FUELS. PART II (FINAL REPORT). *Michigan Univ., Ann Arbor, Coll. of Engineering, Electric Power Research Inst. Grant 206-0-0, Proj. 206-0-0, Rept. EPRI 206-0-0-2, 109p., Feb. 1974. 179 refs.*

NTIS: PB 234203

Six general methods of coal utilization with elimination of the sulfur prior to or during combustion in an electric power generating plant are reviewed. Thirty-seven processes are reviewed: five in fluidized bed combustion; one in coal beneficiation; three in pyrolysis; 22 in coal gasification; and six in coal dissolution and liquefaction. The processes in each category are reviewed, analyzed, and evaluated. The processes must be potentially better than stack gas cleaning processes to be considered as a viable alternative to the electric power industry. The advantages and disadvantages of the processes are identified. (Author abstract modified)

47605 **APTIC NO. 70253**

Terada, H.

CONTROL OF NITROGEN OXIDES PRODUCTION IN A FIXED BURNING APPARATUS. *(Kotei nenshosochi ni okeru NOx no seisei yokusei). Text in Japanese. Kagaku Sochi (Plant Process), 16(2):35-46, Dec. 1974. 12 refs.*

Basic nitrogen oxides control methods for practical furnaces are described for two small test furnaces. The cooling effect of the surrounding wall, nitrogen in the burning system, mixing condition of fuel and air, control by changing raw fuel materials, multistage burning processes, recycling of burning waste gas, simultaneous injection of water and methanol, and the condition of burner and furnace room are discussed. Good control of NOx generation depends on the appropriate selection of a process or a combination of processes. For example, the relationship of temperature and NOx produced is a function of the relationship of absorbed heat of the surrounding wall and NOx produced. Nitrogen in fuels is thought to be more important than atmospheric N. Multistage burning process is impractical. Methanol is the best clean fuel.

47606 **APTIC NO. 69297**

Tohata, Heiichiro

THE STACK GAS DENITRIFICATION PROCESSES IN JAPAN. *(Wagakuni ni okeru haien dassho purosesu). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology. p. 55-67, 1974. 17 refs. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

The dry processes of denitrification are: catalytic decomposition, catalytic reduction (non-selective and selective), alkaline mixture absorption method, electron irradiation, adsorption; the wet processes are nonoxidation alkaline absorption, oxidation absorption, gas oxidation absorption, catalytic oxidation, oxidation additives, liquid oxidation, oxidized reduction absorption, nonoxidized reduction absorption, the complex salt method, and acid absorption method. Compared with the dry methods, the wet methods are less affected by sulfur dioxide, steam, dusts, and metals, and the system can be smaller. These points are advantageous. But a wet method requires the treatment of liquids; diffusion of stack gas is also more difficult because of the low temperature of the smoke, and it can cause white smoke in winter. The technique of liquid treatment is far behind other aspects of technical advancement. However, since the stack gas desulfurization method is mainly a wet process, for the purpose of developing a simultaneous denitrification process, the wet type will be clearly advantageous. The known methods of simultaneous treatment for SOx and nitrogen oxides are the TYCO, ESSO, and Sumikin/Fuji Kasui processes. The Sumikin/Fuji Kasui is a one-tower absorption method by chlorine dioxide and caustic acid solution, and has an extremely high rate of desulfurization-denitrification; but the liquid treatment presents a problem. Other methods that are still in the test plant stage are the potassium manganate oxide method and nonoxidation reduction absorption. There is a possibility of developing the wet Cottrell into a low-cost dust collector and denitrification/desulfurization system.

47607 **APTIC NO. 69736**

Tsuji, Masakazu

DEVELOPMENT OF LOW-NOX BURNERS. *(Tei NOx bana no kaihatsu). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, p. 43-53, 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

Newly developed low nitrogen oxides burners are discussed. The pressure jet divided combustion burner creates small flame group by a multiple number of atomized flows of fuel by a spiral pressure jet spray. The steam atomization divided burner has a multiple number of jet nozzles arranged in such a way the several jet streams of flame shoot outwardly, not interfering with each other. A step steam atomization long flame burner is a multiple number nozzle with various diameters, and small nozzles are more in number and arranged so that the flames come out in different lengths, creating even combustion rate for the entire length of the flame. The circular whirlpool mixture burner is designed to create a large angle burner tail and a large air resister angle so that the primary combustion belt forming the circulation whirlpool will be large. The flat circular flame burner is designed to create a large jet injection angle and the air is injected in the same angle to form a thin flat circular flame with a large surface area of flame. The fan shape flat surface burner has many nozzles arranged in a long rectangular shape, with the outer nozzles with greater angles. The air throat is long and thin so that the flame is a thin, fan shape with a large surface. Test combustion was conducted at an operating boiler, and the divided combustion method was most effective for attenuation of NOx emission. The results are discussed with diagrams, graphs, and photographs.

47608 **APTIC NO. 69288**

Tunemi, Masaaki and Hiroshi Ishii

WASTE GAS PURIFICATION METHOD. *(Hai gasu no joka hoho). Text in Japanese. (Nippon Sekiyu K. K. Japan)) Japan. Pat. Sho 49-41262. 8p., Nov. 8, 1974. (Appl. Dec. 25, 1970, 1 claim).*

A cleansing method for waste gas such as internal combustion engine exhaust gas by catalytic reduction is described. Nitrogen oxides, particularly nitric oxide, are reduced to nontoxic substances in the presence of catalysts of active metals carried on alumina hydrogel, silica aluminal hydrogel, alumina, or silica alumina. To the hydrogel prepared by heating an aqueous colloidal solution of basic aluminum sulfate or a mixture of basic aluminum sulfate colloidal solution and silical sol, an aqueous alkali solution was added and heated. The alumina hydrogel or silica alumina hydrogel produced, or alumina or silica alumina obtained by subsequent drying and calcining, is immersed in an aqueous solution of one or more of two types of metals selected from among potassium, copper, barium, vanadium, chromium, molybdenum, manganese, iron, cobalt, nickel, ruthenium, rhodium, palladium, iridum, and platinum, dried and calcined. The data on physical properties of catalysts obtained and conversion rates of NO are evaluated.

47609 **APTIC NO. 70152**

Voelz, F. L.

EXHAUST GAS DILUTION AND ITS EFFECT ON MANDATORY EMISSION TESTING. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 99-121. (Sept. 25-27.)*

Factors affecting the effectiveness of motor vehicle emissions inspection-maintenance programs are reviewed with particular emphasis on the effects of exhaust gas dilution. Analysis of data obtained from over 15,000 in-service vehicles indicates that measurement of only hydrocarbons and carbon monoxide emissions does not give the true emissions from a vehicle. The presence of defective exhaust systems or air pump emission control systems cause erroneously low emission levels to be measured. Correction for exhaust gas dilution on nonair pump equipped vehicles shows that the average idle hydrocarbons measured must be increased by more than 20% for pre-1968 vehicles. An increase of more than 25% in average idle carbon monoxide measurements is necessary for 1970 and newer vehicles. Correction of the measurement emissions for the effects of dilution increases the number of vehicles failing inspection by an estimated 20%. A possible solution to the variable dilution situation is to measure the exhaust gas dilution and establish failure limits based on dilution correction emissions.

47610 **APTIC NO. 70234**

Wagener, K. and K. Winter

ADSOX - COMBINATION OF ADSORPTION AND OXIDATION FOR ELIMINATION OF EMISSIONS OF ORGANIC VAPORS. *(ADSOX - Kombination von Adsorbieren und Oxidieren zur Beseitigung von Emissionen organischer Daempfe). Text in German. Dechema-Monograph., 25(145201485):193-202, 1974.*

The ADSOX system, a combination of adsorber and thermal incinerator for the removal or organic malodorous vapors in industrial plants, is described. The organic vapors are adsorbed by activated carbon at temperatures below 125 C, after which the activated carbon is regenerated by means of a 10:1 to 3:1 mixture of hot inert gas and flushing air at temperatures ranging from 200 to 700 C. The desorption temperature should by 50 to 250 C higher than the boiling point of the adsorbed substance. The gas obtained from the desorptin process contains the adsorbed organic vapor in concentrations in the order of magnitude of 100 g/cu m and is burnt off without the use of auxiliary fuel. The ADSOX process excels by its high economy and efficiency.

47611 **APTIC NO. 65178**

Walsh, Michael P. and Norman Friberg

AN EVALUATION OF THE OXIDATION CATALYST ON LIGHT-DUTY VEHICLES. *Preprint, Air Pollution Control Assoc., 18p., 1974. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-4.)*

A 15-month test of the Engelhard PTX-423 catalyst was conducted on five New York City police cars in normal police service retrofitted with the device. The amount of reduction deteriorated with mileage. Emission reductions, averaged over 25,000 miles, were 64% for carbon monoxide and 55% for hydrocarbons. A catalyst inspection showed severe lead and temperature damage. No adverse effects on driveability or fuel economy were found. Catalytic converters are a practical means of reducing exhaust emissions from in-use passenger cars. Catalyst deterioration could be minimized by the use of a high temperature protection device and by more careful control of gasoline lead content. The cost per vehicle should range from $200-350, including installation. Thorough investigation of sulfate and particulate emissions are recommended before implementation of a full-scale retrofit program. (Author abstract modified)

47612 **APTIC NO. 69670**

Whiting, L. V. and J. O. Edwards

REMOVAL OF MAGNESIUM FROM ALUMINUM BY FUMELESS CHLORINE TREATMENT. *AFS Amer. Foundrymens Soc. Trans., 1974:189-192, 1974. 26 refs.*

Experiments were conducted on the chlorine treatment of liquid aluminum alloys for the removal of magnesium. These demonstrated the reaction mechanisms. The desired objective was achieved without the evolution of any kind of fume. The initial products of the chlorination, magnesium chloride and aluminum chloride, could be further reacted to produce liquid magnesium chloride as the end product. This could be achieved by enclosing the system so that the aluminum chloride had sufficient time to react and by controlling the chlorine flow rate. It is believed that the magnesium reduction could be accomplished just as rapidly as with normal open-bath lancing where the reaction products are allowed to escape and contribute to pollution. Initially, while the magnesium content was high, very high chlorine flow rates could be used without escape of gaseous products from the reaction enclosure; as the magnesium content was reduced, the Cl2 flow rate had to be reduced to prevent escape of gases. Additional elements such as copper, silicon, and zinc influence the permissible Cl2 flow rate in these reactions, but the experiments were too limited to define the complex interrelationships involved. Other small-scale tests indicated that Mg could not be removed by selective oxidation in air, but this could be accomplished to some extent by agitation under a Mg Cl2 flux cover. Small amounts of sodium could be picked up from fluxes based on sodium chloride, but this unwanted sodium could be completely removed by Cl2 flushing under a MgCl2 flux cover. (Author abstract modified)

47613 **APTIC NO. 69851**

Yagi, Shizuo and Toru Hatanaka

COMBUSTION CHAMBER DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan ni okeru nenshoshitsu sochi). Text in Japanese. (Honda Giken Kogyo KK Tokyo (Japan)) Japan. Pat. Sho 49-41204. 3p., Nov. 7, 1974. (Appl. May 31, 1971, 1 claim).*

A device is described for heating the secondary combustion chamber, where ignition occurs, in an internal combustion engine. By installing an easily heated combustion tube in the secondary combustion chamber and connecting it to a heater, the fuel supplied to the secondary combustion chamber is heated whenever necessary for instant vaporization. When the desired temperature is reached, heater action automatically ceases. Reliable ignition for a cold engine is made possible, and warmup time is reduced. A diagram of the engine with device is included.

47614 **APTIC NO. 69847**

Yamada, Kiichi

APPARATUS FOR THE REMOVAL OF POISONOUS GASES FROM STACKS, ETC. *(Entotsuto yori haishutsu sareru yudoku gasurui no jokyo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-34899. 4p., Sept. 18, 1974. 1 ref. (Appl. Jan. 31, 1970, 1 claim).*

Poisonous stack gases can be absorbed, made to adhere, and neutralized on an endless mesh belt of an F-shaped configuration, which moves at fixed intervals. Fine stainless wire, glass wool, or other corrosion-resistant fibers are used on the belt. As poisonous gases are pulled out of the chimney by an impeller, they are made to pass through this belt, which is spray-coated with an absorption-adhesion-neutralization liquid as it revolves. The belt, now containing the poisonous gases, passes through a heated, spray-washing installation, which cleans the belt and collects the impurities for further disposal. Poisonous gases are caught on the horizontal bars of the F-shaped belt. Spray- coating and spray-washing operations occur along the vertical bar of the F, which is outside the chimney proper. Consequently, the stack remains free of liquids, while the belt purifies the stack gases and is self-cleaning.

47615 **APTIC NO. 69216**

Yamamoto, Takashi

DUST PRECIPITATION OF EFFLUENT GAS FROM CLINKER COOLERS --- PROBLEMS AND COUNTERMEASUREMENTS. *(Kurinka kura haigas no shujin --- Mondai to sono taisaku). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):69-73, 1974. 5 refs.*

The greatest concern for cement manufacturing companies in environmental protection is dust precipitation from their production process. Dust precipitation techniques are reviewed, including the centrifugal, filter, electrical, and combination methods. Due to the construction of a kiln and clinker cooler, dust precipitation from a clinker cooler cannot yet be satisfactorily controlled. The main problems encountered are dust size, variable temperature of the effluent gas, and large quantity of the gas. These factors impose limitations on the function of dust precipitators. Of the techniques available, the combination technique is relatively reliable and durable.

47616 **APTIC NO. 69740**

Yamate, Noriaki and Eiji Ueda

DEVICE FOR THE PREVENTION OF THE RELEASE OF VAPORIZED GASOLINE INTO AIR. *(Johatsu gasorin no taiki hoshutsu boshi sochi). Text in Japanese. (Toyo Kogyo K. K. (Japan)) Japan. Pat. Sho 49-40166. 2p., Nov. 5, 1974. (Appl. Sept. 24, 1969, 1 claim).*

A device for preventing the release of vaporized gasoline from automobiles into air was designed. The vapor pipe of a condenser tank located on top of the fuel tank is attached to the pipe connecting the crankcase and inlet manifold of the carburetor leading to the air cleaner. Inside the air cleaner a cartridge containing an adsorbent such as activated charcoal for adsorbing vaporized gasoline is placed at the outer circumference of the filter. The gasoline vaporized during the stop period of the engine is mostly liquefied in the condenser, however, the unliquefied gasoline vapor is led into the crankcase and to the air cleamer where it is adsorbed onto the adsorbent, thus preventing its release into the air. During the engine operation, the vaporized gasoline on the adsorbent is released by the air drawn into the air cleaner and led into the engine through the carburetor and inlet manifold and burned. Since the gasoline adsorbed is released by the engine operation, the absorbency can be maintained without deterioration.

47617 **APTIC NO. 69306**

Yamazaki, Kiroku

VEHICLE EMISSION CONTROL AND CRANKCASE OIL QUALITY. *(Jidosha no haiki kisei to junkatsu-yu). Text in Japanese. Junkatsu (J. Japan Soc. of Lubrication Engrs.), 19(6):429-436, June 1974. 22 refs.*

The improvement of gasoline engines for environmental protection, the relation between the nature of the fuel and the composition of discharged gases, the roles of fuels and lubricating oils in atmospheric pollution, the effect of recirculation of discharged gases, and the treatment of discharged gases with catalysts are discussed. Both the hydrocarbons and carbon monoxide contents decrease as the air fuel ratio increases, whereas the nitric oxide content shows a maximum in the NO content-A/F ratio curve. The maximum of the NO concentration appears in the neighborhood of the A/F ratio where the efficiency of the engine is the highest. Therefore, the elimination of NO is very difficult. The lowering of combustion temperature and the reduction by catalysts after combustion are most promising. At present, recirculation of discharge gases, layer combustion, 2-stage combustion, and reduction with catalyst are being used to some extent. The lead content in gasoline is being decreased both in the U. S. and in Japan, though the motives are different. The use of platinum catalysts gives the most effective operation of engines and fuels, but the catalyst is poisoned by various agents such as lead and phosphorus. The decrease of the ash content of crankcase oil is also important in keeping the discharged gases clean. The decrease of the ash content is also an effective means to elongate the life of catalysts.

47618 **APTIC NO. 65160**

Yamazaki, Shigeru

RECENT TRENDS IN EQUIPMENT FOR TREATING EXHAUST GAS FROM A CONVERTER AND AN OXYGEN CONVERTER GAS RECOVERY PROCESS. *(Saikin no tenro haigasu shori setsubi ni tsuiteno doko to OG sochi). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 283:7-12, May 1974.*

Three methods available for treating exhaust gases from a converter are the complete combustion type, incomplete combustion type, and partial combustion type. The incomplete combustion type is most widely used recently. The Oxygen Converter Gas Recovery Process is particularly efficient. Incomplete combustion types can treat less than 1/4 of the gases handled by the complete combustion type. The temperature is lower at an inlet of the cooler by 300 C than at that of complete combustion type. Oxidization of dust is low. It is capable of collecting carbon monoxide. This equipment consists of a gas-cooling system, a dust separator, and a gas-collecting system.

47619 **APTIC NO. 69734**

Yanobetomo, Sakae

STACK FOR SMOKE PREVENTION. *(Baien boshi entotsu). Text in Japanese. (Sakae Yanobetomo (Japan)) Japan. Pat. Sho 49-36258. 2p., Oct. 3, 1974. (Appl. Nov. 6, 1970, 1 claim).*

A stack with a smoke cleansing device for common incinerators was designed for the purpose of removing soot and water soluble gaseous particulates by spraying water. It is designed also to facilitate smoke emission, improve combustion efficiency, and prevent air pollution. The stack consists of upper and lower stack sections with enlarged mid section. In the upper section, a water nozzle for downward spraying is placed near the lower end and several water nozzles for upward spraying are placed on top of the downward spray nozzle. An umbrella shaped dripping board with diameter larger than the upper and lower stack sections is suspended in the enlarged midsection. The cylindrical lower end of the midsection is extended over the upper part of lower section of the stack, thus forming a passage for water leading to the drainage pipe. The lower end of the upper section of the stack and umbrella shaped dripping board are jagged for guiding water drips. The smoke flow retarded by the downward spraying is facilitated by several upward spraying streams while the smoke is subjected to further washings. The device is structually simple and the running cost is low.

47620 **APTIC NO. 69733**

Yokota, Noriyuki, Shingo Tokuda, and Yoshiro Ito

METHOD FOR THE REMOVAL OF MERCURY IN GAS. *(Gasuchu no suigin jokyo hoho). Text in Japanese. (Osaka Soda Co. (Japan)) Japan. Pat. Sho 49-35504. 3p., Sept. 24, 1974. (Appl. Dec. 15, 1970, 1 claim).*

The removal of mercury in gas can be accomplished by using a solution, slurry, or an adsorbing carrier containing organic compounds which have the following characteristics: having a sulfhydryl group or its alkali salt and being able to form mercaptide salt with Hg; or having an SH or its alkali salt or a thiocarbonyl group accompanied with an N, S, NH, NN, or a NHNH group and being able to form complex with Hg. Raschig rings were packed in an acrylic resin column 15 cm long and 60 mm inside diameter. Twenty liters of an aqueous solution containing 400 g sodium diethyldithiocarbamate and 250 g hydroxyammonium chloride were circulated from the top of the column at a space velocity of 10 m/hr. Hydrogen gas containing 20 mg/cu m of Hg was introduced from the bottom at a space velocity of 250 m/hr. The Hg concentration in the gas after 48 hr of operation was reduced to 4.0 micrograms/cu m.

47621 **APTIC NO. 75021**

Zarayskiy, S. B.

PROSPECTS FOR THE COMBUSTION OF WATERY FUELS IN USSR POWER PLANTS. *(Perspektivy szhiganiya obvodnennykh topliv na elektrostantsiyakh sovetskogo soyuza). All Union State Inst. for the Planning of Electrical Equipment for Heat Engineering Structures (USSR), Kharkov Div., 1974 (?). Translated from Russian, 14p.*

The introduction of the hydraulic coal mining method requires the development of the most rational schemes for the combustion of water fuel in the steam power plants which are the main users of solid fuel in the country. A method for burning water fuels such as coal-water suspension is described. The economy of hydraulic coal mining and the combustion of water fuel is described during an analysis of the entire power engineering process. The following four designs were used to study the engineering aspects and economics of various coal mining, transport, and combustion methods: combustion of dry-mined solid fuel; combustion of hydraulically mined solid fuel, enriched and dewatered in the mine, in the form of dust; direct combustion of a water-coal suspension in the firebox of a boiler; and combustion of a water-coal suspension in the form of dust after preliminary steam drying in the State Regional Power Plant. This method can be used to burn coal-water suspensions produced by flotation cleaning of coal as a fuel.

47622 **APTIC NO. 65843**

Industrial Pollution Control Assoc. (Japan)

BAD ODOR CONTROL MEASURES FOR KP PLANTS. *(KP kojo no akushu boshi taisaku ni tsuite). Text in Japanese. Sanyo Kogai (Ind. Public Nuisance), 10(7):75-95, July 1974. 8 refs.*

Odor control measures for the batch type digester of a Kraft Pulp Mill, the treatment of bad odor elements from a vacuum distillater, and odor measurements in the vicinity of a KP mill are discussed. The batch digester deodorization system consists of a direct contact cooler, a drain tank, a water trap, a flame arrester, a burner, and the control parts including a blow gas cooler pressure indicator and alert, a flame arrester pressure difference alarm, a burner fan exchange valve interlock burner fan and a gas switch to the stack, and a flow control device. Bad odor from a Kraft Pulp mill consists of hydrogen sulfide, methylmercaptan, dimethylsulfide and dimethyl disulfide. The major portion of the bad odor is produced from the bad odor condensate drain from the vacuum distillation boiler, which can be treated in two ways. Non-condensate gas goes to the gas absorption device. The bad odor condensate drain goes to the multi-step valve cap tray deodorization system. This can be done by air stripping or steam stripping. Air stripping is generally considered economically advantageous because of the high cost of steam. But more recently, a reduced pressure operation of steam stripping has achieved lowering of the running cost.

47623 **APTIC NO. 69286**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

THE RESULT OF FIELD TESTS ON AUTOMOBILES USING IGNITION TIMING CONTROL DEVICE AND CATALYTIC DEVICE. *(Tenka jiki seigyo sochi to shokubai sochi no heiyo ni your jissha tesuto kekka). Text in Japanese. 12p., July 1974.*

The simultaneous use of an ignition delay device and a catalytic device was studied for testing the durability, safety, and driving performace of a car. The possibility of secondary pollution by the catalytic metal was also examined. Twelve automobiles (six 2000 cc and six 1600-1800 cc) were given 10,000 km driving tests and mode tests by a dynamometer. Carbon monoxide, hydrocarbons, and nitrogen oxides were measured at the time of catalytic device installation (zero mileage), 2000 km, 6000 km, and 10.000 km. The measurements were taken for four modes, ten modes, and constant driving speeds of 20, 40, 60, and 80 km/hr. The simultaneous use of the two devices reduced CO at zero mileage by 92% (4 modes) or 86% (10 modes) but the rate decreased with the increase of mileage, and with 10,000 km, the rate was 49% (for 4 and 10 modes). When only the ignition delay device was used, the CO control rate was 5% at zero for both mode tests, and was minus 4% (4 modes) and 5% (10 modes) at 10,000 km. The HC were controlled by 70% (4) or 66% (10) at zero mileage, and the rate decreased with the increase of mileage to 33% and 24%. The rate of reduction by the ignition delay only was extremely low, as in the case of CO. The NOx were decreased by 36% (4 modes) and 21% (10 modes) at zero mileage, and by 37% (4 modes) and 18% (10 modes) at 10,000 km. With the use of the ignition delay device only, the NOx reduction rate was 27% and 19% initially, and with 10,000 km, 29% and 19% respectively. Further experiments with the catalytic device only proved that the effects of CO and HC control were largely brought by the catalytic device; the effects of NOx reduction and endurance were largely due to the use of the ignition delay device, and the simultaneous use of a catalytic device increased NOx emission slightly. The measurement of catalytic metal emission was technically difficult by the availabe measurement techniques. It was confimed that a simultaneous use of the two devices could successfully control all CO, HC, and NOx to meet the legal requirements.

47624 **APTIC NO. 69252**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

REPORT ON THE INVESTIGATION OF NOX REDUCTION MEASURES FOR DIESEL ENGINE VEHICLES IN USE. *(Jizerusha (shiyo kateisha) no chisso sankabutsu sakugen taisaku ni kansuru chosa kekka ni tsuite). Text in Japanese. 15p., July 1974.*

Diesel engine vehicles emit about 1/3 of carbon monoxide and hydrocarbons gasoline engines do, but a diesel bus emits about 3.8 times and a truck about 1.5 times the amount of nitrogen oxides a gasoline vehicle does. Using a 11-ton diesel truck with six different diesel engines (A and B, precombustion chamber type; C and D, direct jet injection type; E and F, swirl type), road tests were given with different amount of concrete blocks, while the speed, engine rotation speed, and emissions were checked by a data recorder and computer. Hydrocarbons were measured by a flame ionization detector, nitrogen oxides by a chemiluminescence analyzer, and black smokes by a filter paper type smoke meter. All six engines showed a tendency to have decreased NOx emission with fuel injection time delay. The effect depended on the type of the combustion chamber, though within the same type, there were individual differences. The best results were obtained by the direct injection engine, followed by the pre-combustion type. With a delay angle of 3 deg, the minimum was 11% (Engine A) and maximum 31% (engine B); with a 5-degree delay, minimum 17% (E) and maximum 41% (B); and with a 7-degree delay, minimum 26% (E) and maximum 41% (C) were obtained. It was concluded that the fuel jet injection time delay was effective in controlling the amount of NOx emission. The variation in the fuel cost, exhaust temperature increase, and the power output impairment will depend on the type of the combustion chamber and engine. But if an optimum delay angle can be determined for each engine, NOx can be effectively controlled. Also, it was confirmed that driving with less than the maximum load was effective for controlling the amount of NOx emission.

47625 **APTIC NO. 69331**

Atomic Energy Commission, Washington, D. C., Office of Information Services

COAL PROCESSING: GASIFICATION, LIQUEFACTION, DESULFURIZATION A BIBLIOGRAPHY 1930-1974. *763p., Oct. 1974. 7441 refs.*

NTIS: TID-3349

A bibliography of 7441 references on coal gasification, liquefaction, and desulfurization is presented. The bulk of scientific and technical information published on these subjects since the early 1930 s was cataloged, indexed, and stored in machine readable form. References are arranged in these subject categories: general, processing, by-products, properties, and waste management. Processing is further categorized into carbonization, desulfurization and purification, hydrogenation, gasification, liquefaction, pyrolysis and cracking, and solvent extraction. There are personal author, subject, and report number indices. The personal author index is made up of an alphabetic listing of all authors of references. The authors names are followed by the titles of the documents and citation numbers. For documents having multiple authors, the second and succeeding authors are referenced to the first author. The subject index is an alphabetic listing of the more significant of the subject descriptors chosen to describe the document content. In most instances the subject descriptors are entered in pairs separated by a slash, and the second term was selected to be more specifically delineate the first. Each subject entry is then followed by the title of the document, the elaborating clause or phrase, and the citation number. The report number index is an alphanumeric listing of report numbers. The report numbers are followed by availability statements that include all known information related to the public availability and price of the reports. A glossary is included that briefly describes 55 various named processes used in converting and purifying coal. These processes are Adip, Alkazid, Atgas, Beavon, Benfield, Bi-Gas, Carbon dioxide acceptor, Catacarb, Chemico, Cleanair, Coed, Cogas, Consol, CSF, Fischer-Tropsch Synthesis, Fluor Econamine, Fluor solvent, Fulham-Simon-Carves, Giammarco Vetrocoke Sulfur, H-Coal, Hydrane, Hygas, IFP, Kellogg, Koppers-Totzek, Lurgi, Molecular sieve, Molten carbonate, Moving-burden, Pamco SRC, Perox, Pott and Broche, Purisol, Rectisol, Scot, Seaboard, Seacoke, Selexol, SNPA-DEA, SRC, Stone and

Webster ionics, Stretford, Sulfinol, Sulfreen, Synthane, Synthoil, Takahax, Toscoal, Townsend, Tyco, U-Gas, Uhde-Pfirrmann, Westvaco. Winkler, and W-L Sulfur Dioxide Recovery.

47626 **APTIC NO. 69361**

Office of Air and Waste Management, Ann Arbor, Mich., Technology Assessment and Evaluation Branch

EVALUATION OF THE MSU 4-CYLINDER CONVERSION TECHNIQUE FOR V-8 ENGINES. *Rept. 75-11 DWP, 9p., Oct. 1974. 1 ref.*

Mileage and emissions tests (1972 hot Federal Test Procedure) were performed on a 1968 Chevrolet Impala with a 307 cu in. V-8 engine modified to run on four cylinders only. The 1975 Federal Test Procedure could not be used in the evaluation due to cold start driveability problems. A 19% improvement in fuel economy was observed over the LA-4 driving cycle as a result of the 8-cylinder to 4-cylinder conversion. The vehicle was unable, however, to follow the trace during the high speed (57 mph) acceleration. Emissions of hydrocarbons and nitrogen oxides decreased 24 and 5%, respectively, while carbon monoxide emissions increased by 58%. Highway cycle results showed a 16% improvement in fuel economy and decreases in hydrocarbon and carbon monoxide emissions of 47 and 33%, respectively; nitrogen oxides increased by 36%. The carburetor modifications required for the cylinder number reduction conversion were capable of causing significant exhaust emission increases in the absence of exhaust emission testing for determining specific changes required for each vehicle/engine combination.

47627 **APTIC NO. 69374**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

SYSTEMS AND COSTS TO CONTROL HYDROCARBON EMISSIONS FROM STATIONARY SOURCES (FINAL REPORT). *Rept. EPA-450/2-74-006, 47p., Sept. 1974. 23 refs.*

NTIS: PB 236921/AS

Estimated costs associated with techniques for controlling hydrocarbon emissions from various stationary sources are outlined. The main stationary sources of hydrocarbon emissions and their estimated emissions in millions of tons per year are: organic solvents usage (4.1-5.6), petroleum refining and marketing (3.6-4.0), and petrochemical manufacturing operations (1.0-1.4). Technical information necessary to evaluate emission control systems for organic solvent usage or their emission control costs is marginal or completely lacking in most cases. The adoption of water-based coatings would significantly reduce emissions from industrial surface coatings operations; however, neither the extent to which water-based coating could be used in place of organic solvent-based coatings nor the costs associated with necessary conversion is known. Control of hydrocarbon emissions from gasoline distribution and marketing is recommended for implementation in two phases: an initial 55% reduction in hydrocarbons by controlling emissions during gasoline loading into tank trucks and trailers and during gasoline deliveries to service stations and a phase II control of emissions during automobile refueling for an additional 30-35% reduction. Many basic technical problems such as successful design of a tight-fit gasoline dispensing nozzle, standardization of automobile fuel tank fill pipes, and establishing the reliability and safety of small vapor recovery units at gasoline service stations remain to be resolved.

47628 **APTIC NO. 69485**

Tennessee Valley Authority, Muscle Shoals, Process Engineering Branch and Tennessee Valley Authority, Chattanooga, Tenn., Power Research Staff

PILOT-PLANT STUDY OF AN AMMONIA ABSORPTION-AMMONIUM BISULFATE REGENERATION PROCESS, TROPICAL REPORT PHASES I AND II. *Environmental Protection Agency Interagency Agreement 31990A, ROAP 21ACX-60, Program Element 1ABO13, Rept. EPA-650/2-74- 049-a, 179., June 1974. 22 refs.*

NTIS: PB 237171/AS

Pilot plant work was performed through June 1973 by the Tennessee Valley Authority for the Environmental Protection Agency on an ammonia absorption-ammonium bisulfate regeneration process for removing sulfur dioxide from the stack gas of coal- fired power plants. The work was carried out sequentially at two pilot plants in the TVA Colbert Power Plant facility. The first pilot plant was used to study the absorption process only, while the second pilot plant was used to study the ammonium bisulfate regeneration stop as well as the absorption step. Both pilot plants were designed for about 4000 acfm of flue gas at 300 F. Two types of scrubbers were studied: a sieve-tray type and a moving marble-bed type. Absorptions of 90% and higher were attained over a wide range of operating conditions. Sulfate levels in the absorber loop had only slight influence on SO2 (180-300 F). Cory ash had a negligible effect on SO2 removal. Temperature of the inlet flue gas had very little effect on SO2 removal in the range covered by the study (180-300 F). Corrosion was not a problem in the absorption loop when using stainless steels and certain nonmetals. Plume formation, while producing liquor with high salt concentrations, was controlled by proper scrubber operation. Adequate separation of fly ash and ammonium sulfate crystals was not achieved in the pilot plant equipment, though with proper equipment and operation adequate separation is expected.

47629 **APTIC NO. 69627**

Environmental Protection Agency, Washington, D. C.

NATIONAL STRATEGY FOR CONTROL OF SULFUR OXIDES FROM ELECTRIC POWER PLANTS. *31p., July 10, 1974.*

As part of the Clean Air Act s mandate to protect and enhance the environment, an extensive national effort is underway to attain current ambient air quality standards for sulfur dioxide. This effort includes a comprehensive program for control of sulfur oxides from steam electric power plants. To attain the standards as rapidly as possible without disruption of electrical power generation and through the use of domestic energy resources, application of control measures on some power plants will be delayed. Of the 1000 existing plants, some 100 coal-fired power plants will require additional controls to meet SO2 standards. The strategy incorporates the following major features: emissions from new plants will be minimized by incorporating the best control measures; measures for existing plants will minimize the adverse effects of acid and particulate sulfates as well as sulfur dioxide; intermittent controls will be used on a temporary basis where attainment of SO2 standards can be expedited by their use; immediate application of control measures to existing plants which do not cause violations of the current standards will be given lower priority until attainment of the standards in other areas in assured; and Federal enforcement orders will be issued where necessary to ensure that available control measures are applied under optimum time schedules nationwide. The strategy will not require or authorize the use of intermittent control as a permanent substitute for constant emission controls, but temporary use of intermittent controls in carefully selected circumstances will be allowed. Available sulfur oxides control methods include use of low sulfur fuel, desulfurization of fuel, stack gas desulfurization, intermittent or periodic control systems, and tall stacks. (Author summary modified)

47630 **APTIC NO. 69709**

THE PRESENT CONDITION OF DEVELOPMENT OF EMISSION PREVENTION TECHNIQUES FOR NOX FROM FIXED SOURCES. *(Kotei hasseigen ni kakaru chisso sankabutsu no haishutsu boshi gijutsu no kaihatsu jokyo ni tsuite (I)). Text in Japanese. Kankocho Kogai*

Senmon Shiryo (Public Nuisance Gaz), 9(6):3-24, Nov. 1974.

Hearings held in June 1974 by the Environmental Bureau, Japan, on the present status of technological development of emission control of nitrogen oxides (NOx) from stationary sources are summarized. Fourteen companies actively involved in technological development testified. The NOx emission concentrations were calculated by a formula dependent on the residual oxygen concentration in the exhaust gas. Emphasis was placed on suppression of NOx formation by burner improvement. The effect of combustion load factor and nitrogen content of the fuel on NOx formation was also discussed. Burners which suppress NOx formation can be of the following types: a system where mixing of air and fuel is accelerated; a system of splitting in the main flame into little flames; a system of self-recycling exhaust gases in the burner; and two-stage combustioa systems. Low NOx burner systems are sketched and described. Nitrogen contents of coal, oil, and natural gas from various sources are tabulated, as are the conversion rates of nitrogen compounds in fuels to NOx. Concentration measurements of NOx emission from power plant boilers and experimental results from attempts to lower the NOx emission are tabulated. Boiler improvements are described. Exposition of 1974 pollution regulations from Japan, discussion of the mechanism of NOx formation by combustion, and atmospheric pollution by NOx are included. Possible technological limits to NOx emission treatment are foreseen, because of limitations imposed by the kinds of fuel used.

47631 **APTIC NO. 70123**

National Academy of Sciences National Academy of Engineering, Washington, D. C., Coordinating Committee on Air Quality Standards

AIR QUALITY AND AUTOMOBILE EMISSION CONTROL. VOLUME 4: THE COSTS AND BENEFITS OF AUTOMOBILE EMISSION CONTROL. *93rd Congress (Senate), 2nd Session, Serial 93-24, 477p. Sept. 1974. 140 refs. (Prepared for the Committee on Public Works.)*

A cost/benefit analysis of air quality and automobile emission control was made. There are two strategies for improving the benefit/cost ratio: some form of two car strategy wherein only about 37% of the United States fleet would always be required to meet the strictest standards; and an abandonment of the .4 gpm target for nitrogen oxides emissions in favor of the interim 2.0 standard. Either strategy would effectuate substantial cost savings. These savings are not additive or independent of one another. If the strict NOx standards are pursued, the two car strategy becomes substantially more attractive, since only then could the estimated annual costs seemingly be brought close to the best estimate or guess of the average expected annual benefits. If the strict NOx standards are abandoned in favor of a 2.0 gpm target, few potential savings might remain to be realized from any alternative cost- reducing strategy. A relaxation of the NOx standard could open up technological possibilities that eventually might make the costs of meeting the automobile emission standards negligible. (Author summary modified)

1973

47632 **APTIC NO. 69622**

Ashworth, Robert A. and Carl A. Bolez

A DOLLAR AND CENTS APPROACH TO THE CLEAN CONVERSION OF COAL TO ELECTRIC POWER. *Preprint, American Inst. of Chemical Engineers, New York, 22p., 1973. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., 1973, Paper 7d.)*

The economics of processes which should be commercially available in the near future for generating electric power from high sulfur coal in an environmentally acceptable fashion are discussed. The simplest approach to the environmental problem associated with conventional coal-fired units is to clean the flue gases before they are emitted to the atmosphere. Commercial wet scrubbing systems will soon be available that will be viable and will reduce the sulfur dioxide to tolerable levels. Most of the commercial scrubbers will probably use systems that produce a throw-away sulfur by-product. Direct combustion of coal in conventional cycles with fluid bed boilers is possible by an Ignifluid boiler or a fludized bed boiler. Also, low Btu gas is available from coal gasification processes. It can be burned in conventional boilers and conventional combined cycles without causing significant pollution. Low Btu gas from coal gasification can also be used in advanced combined cycles in which higher inlet temperatures to the gas turbine blading and to pressure systems integrated with gasification improve efficiency and reduce cost. Coal can be dissolved in aromatic oil, the solids high in ash content removed, and a low-sulfur residual fuel produced. A sulfur content of less than 1% can be expected for most American coals. This coal extract residual fuel can be burned to produce low SO2 levels, and firing techniques can be arranged to reduce nitrogen oxide levels. A super-charged fluid bed combustion/combined cycle reduces SO2 emissions by the use of dolomite limestone in the bed, and reduces NOx emissions by the low boiler operating temperatures. Capital costs for a 600 megawatt unit for 1973 without inflation and I.D.C. are estimated as $265/kw for stack gas cleanup in a conventional plant, $250/kw for an Ignifluid boiler, $210/kw for dolomite in a fluid bed combustion, $310/kw for low Btu gas in a conventional steam cycle, $255/kw for low Btu gas in a conventional combined cycle, $230/kw for low Btu gas in an advanced combined cycle, $205/kw for coal extraction residual fuel in a conventional steam cycle, and $200/kw for super-charged fluid bed combustion in a combined cycle with dolomite in the bed.

47633 **APTIC NO. 69597**

Baker, C. D., E. W. Clark, W. V. Jesernig, and C. H. Huether

RECOVERY OF P-CRESOL FROM PROCESS EFFLUENT. *Preprint, American Inst. of Chemical Engineers, New York, 20p., 1973. 7 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 11-15, 1973.)*

Because of the recent emphasis on environmental control and air pollution in the metropolitan Chicago area, efforts in the Sherwin-Williams Company have been directed toward reducing visible and odorous discharges to the atmosphere. One waste water process stream contained 3000-5000 ppm cresylics and 20-30% dissolved solids, primarily sodium sulfite and sodium sulfate. The stream was oxidized by air to sodium sulfate prior to discharge to the plant sewer steam. A characteristic odor resulted, caused by p-cresol concentrations of more than 1 ppb. A process was developed to recover the p-cresol from the process effluent to eliminate the odor. The most promising treatment, carbon adsorption of sulfite effluent prior to oxidation, followed by chemical regeneration of cresylics adsorbed on the carbon was developed to return a valuable product to the process, to eliminate the odor problem, and to reduce the discharge of pollutants in the sewage. The laboratory and pilot plant program to demonstrate the feasibility of this approach and to determine any subsequent effect on the oxidation of the treated effluent is described. Based on the laboratory and pilot plant work and an economic evaluation indicating an after-tax return which would pay off the investment in less than 2 yr, funds were appropriated for construction of a carbon adsorption facility. The plant and its costs are described.

47634 **APTIC NO. 64151**

Balogh, Andras, Jozsef Herendi, and Jozsef Bathory

CLEANING OF TECHNOLOGICAL WASTE GASES FOR ENVIRONMENTAL PROTECTION. *(Technologiai veggazok katalitikus tisztitasa a kornyezet vedelmere). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(11):566-571, 1973.*

Catalytic oxidation provides the most effective method of eliminating gaseous and vaporous materials from chemical and associated plants when the concentrations of the contaminants are below the ignition limit. Noble metals are used as catalysts in many processes of oxidation technology, though they are expensive and sensitive to various catalytic poisons. Catalysts consisting of a mixture of metal oxides can be economically applied to various processes. Application of metal oxide catalysts and technology developed at the Hungarian Oil and Gas Research Institute for a temperature range of 250-350 C results in removal of organic impurities, including various alcohols, aldehydes, benzene, and phthalates. Experimental plant equipment was devised, manufactured, and applied with success in different branches of the industry for minimization of atmospheric pollution.

47635 **APTIC NO. 70091**

Bauerle, George L. and Ken Nobe

TWO-STAGE CATALYTIC CONVERTER. TRANSIENT OPERATION. *Ind. Eng. Chem. Process Design. Develop., 12(4):407-410, 1973. 7 refs.*

A mathematical model for two-stage catalytic exhaust converters was developed by extending the work of others for single-stage converters. Computations of the operational characteristics of the first stage are not in serious error by assuming equal temperatures for the gas and solids phases. On the other hand, computations for the second stage are more in error, but not substantially. The effectiveness of two-stage, axial-flow converters to decrease pollutant emissions varies with reactor diameter; the effect of secondary air rate is not as appreciable. Furthermore, warm-up time varies with diameter much more for the second stage than for the first stage. (Author abstract)

47636 **APTIC NO. 68795**

Baurhenne, Georg

REMOVAL OF ACID COMPONENTS FROM REFUSE INCINERATOR. *(Verfahren zur Reinigung von Abgasen aus Muellverbrennungsanlagen). Text in German. (BAMAG Verfahrenstechnik GmbH, Butzbach (Germany)) W. Ger. Pat. Appl. 2,139,678. 2p., Feb. 15, 1973. 2 refs. (1 claim).*

A method for the removal of acid gases such as sulfur dioxide, sulfur trioxide, hydrogen chloride, hydrogen fluoride, and nitrogen dioxide from waste incinerator flue gases is described. The gas to be purified is passed through a loose layer of active carbon at a temperature that lies 30 C, and preferably 15 C, above the water-vapor dew point. In one example, when flue gas with 3000 ppm HCl, 1000 ppm SO2, 300 ppm SO3, 20 ppm H2F2, and 35 ppm NO2 was passed through a 1.5 m thick active carbon layer at a rate of 0.45 m/sec and at 85 C, the purified gas contained 3 ppm HCl, 10 ppm SO3, 1 ppm H2F2, and 5 ppm NO2. The activated carbon is regenerated by washing first with water, and then with dilute ammonia solution.

47637 **APTIC NO. 69973**

Bogdan, L., A. Burke, and H. Reif

TECHNICAL EVALUATION OF EMISSION CONTROL APPROACHES AND ECONOMICS OF EMISSION REDUCTION REQUIREMENTS FOR VEHICLES BETWEEN 6,000 AND 14,000 POUNDS GVW. *Calspan Corp., Buffalo, N. Y. Office of Air and Water Programs Contract 68-01-0463, EPA-460/3-73-005, 351p., Nov. 1973. 70 refs.*

NTIS: PB 232773/AS

An account is presented of a two-part study concerned with the reduction of emissions from the group of vehicles populating the 6000-14,000 pound gross vehicle weight (GVW) range. In the technical evaluation study, state-of-the-art control technology was used to synthesize control system strategies and to estimate their control effectiveness when applied to this class of vehicles. The economic analysis study developed the relationships between the different control strategies and the costs associated with their implementation. A description is given of a computer program developed to assess the impact on emissions and to evaluate implementation costs of the several control strategies. Numerical results are presented. The vehicles studied are classified as medium duty vehicles such as pickup trucks and motor homes. Eight emission control systems are postulated for these vehicles, and the projected reduction factors, fuel penalties, and vehicle performance effects are estimated. Three categories of control approaches were formulated: catalytic converter, thermal reactor, and fuel control (carburetion/ induction). Exhaust emissions are principally weight-dependent. A vehicle mix utilizing catalyst-equipped conventional engines and pre-chamber type, turbocharged diesel engines with exhaust gas recirculation provides the most effective control strategy for hydrocarbons and carbon monoxide and achieves the best fuel economy. Conventional engines equipped with reducing catalysts achieve the most effective nitrogen oxides control. Emission standards for medium duty trucks should apply to the 6000-10,000 lb GVW range. Costs of the different control systems to achieve certain emission levels by varying lengths of time are described. (Author abstract modified)

47638 **APTIC NO. 69889**

Brown, Wilbur

SODIUM: A CLEAN-ENERGY STORAGE MEDIUM FOR VEHICULAR POWER. *California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., LA-5406-MS, 10p., Sept. 1973. 3 refs*

NTIS: LA-5406-MS

The concepts involved in the use of sodium as an energy storage medium are investigated. The energy for the conversion of common salt to metallic sodium is obtained from large, relatively efficient central power plants. The recombination of the sodium and the water yields hydrogen gas in addition to thermal energy. The hydrogen may be burned with oxygen or air to provide mechanical power through a variety of internal and external combustion engine types, or to provide electrical power via direct conversion in fuel cells. Such power, utilized for all types of vehicular propulsion, from power lawn mowers to aircraft, will minimize environmental pollutants. When the initial charge of metallic sodium and water is fully reacted, the lye is off-loaded for recycle at the same station where a new plastic-sealed charge is obtained. In comparison to gasoline, about four times the weight of sodium and water would have to be carried to perform an identical mission. The advantage lies in the use of central station power and in the nonpolluting nature of the sodium recycle. The use of metallic sodium is virtually all forms of land, sea, and air transportation appears technologically feasible and no more hazardous than present use of hydrocarbon fuels. In some respects, it appears to be less dangerous.

47639 **APTIC NO. 75013**

Butylkova, T. N. and G. N. Delyagin

ASH AND CLINKER IN COMBUSTION OF WATER-COAL SUSPENSIONS. *(Zola i shlak pri szhiganii vodougol nykh suspenziy). (Source not given.) 1973 (?). 5 refs. Translated from Russian, 12p.*

To prevent entrainment of fly ash with the combustion products of solid fuel into the atmosphere, costly gas cleaning installations are used. Burning fuel with liquid slag removal does not solve the problem of fly ash. Ash removal is aided considerably by combustion of solid fuel in the form of water-coal suspensions. This type of fuel combustion was studied. In dry ash removal, the ash of water-coal suspensions was sintered in light agglomerates, which significantly facilitated boiler operation. Ash and clinker from the water-coal suspensions can be used as raw materials for the construction industry, as well as for production of fillers, scoria, porous clay fillers for cement, and other materials. This method can be used to burn water-coal suspension obtained from flotation cleaning of coal.

47640 **APTIC NO. 68683**

Cernoch, Svatopluk

THE HEAT TECHNOLOGICAL RESULTS OF WASTE GAS HEAT UTILIZATION IN INDUSTRIAL FURNACES - PART I. TASKS AND PREREQUISITES OF THERMODYNAMIC ANALYSIS OF WASTE GAS HEAT UTILIZATION. *(Die waermetechnischen Ergebnisse der Abgaswaermenutzung bei Industrieoefen - Teil I. Die Aufgaben und Voraussetzungen der thermodynamischen Analyse der Abgaswaermenutzung). Text in German. Energietechnik, 23(12):554-561, Dec. 1973. 26 refs.*

Mathematical calculations of the thermodynamics and thermal balances of furnaces are presented with special regard to waste gas heat utilization. Part of the enthalpy of the combustion products is transferred to the furnace wall and to the materials present in the furnace, after which further heat loss occurs due to heat transfer to the flue gas duct walls. The heat loss of the flue gas that occurs in the heat recovery unit is distributed among wall losses and the heat increment of the combustion air to be preheated. The heat recovery from flue gases can result in increased efficiency of the combustion equipment with constant fuel supply, or in fuel economy with constant performance of the combustion equipment. Formulae for the determination of the efficiency increment and of the fuel economy due to heat recovery are presented.

47641 **APTIC NO. 69954**

Conser, R. E.

THE SHELL FLUE GAS DESULFURIZATION PROCESS – HOW DOES IT STACK UP. *Petrol. Petrochem. Int., 13(8):46-49, Aug. 1973. 2 refs. (Presented at the Institute of Chemical Engineers and Salford Univ. (England), Conference on Control of Gaseous Sulfur Compound Emission, April 9-12, 1973.)*

Because of stricter air pollution standards and the low supply of low-sulfur crude oil, flue gas or fuel desulfurization will be needed. The economics vary between direct and indirect processes, depending on the type of oil being burned. The Shell process is described which can be used for oil- and coal-fired plants. The Shell process uses a dry acceptor in a static packed bed to accept sulfur dioxide from flue gas. The acceptor mass, contained in two or more identifical reactors, is subjected to successive stages of acceptance and regeneration at approximately the same temperature. The net effect is that SO2 is obtained concomitant with the required degree of desulfurization of the flue gas. Total erected costs for a Shell plant at a 650 MW power plant with an 80% load factor would be 28.5 times 10 to the 6th power dollars for Kuwait oil and 23.5 times 10 to the 6th power dollars for Iranian Heavy Oil. Total operating costs would be 9.57 and 7.51 times 10 to the 6th power dollars, respectively. The chemistry of the process and regeneration of the acceptor are described. Demonstration and full-scale units are discussed. The factors used in selecting the Shell process over other types of flue gas desulfurization processes are reviewed.

47642 **APTIC NO. 69463**

De Nevers, Noel and Albert H. Wehe

AN AIR QUALITY APPROACH TO NATURAL GAS CURTAILMENT. *Preprint, American Inst. of Chemical Engineers, New York, 22p., 1973. 6 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 11-15, 1973.)*

A natural gas curtailment procedure designed to improve air quality, i.e., reduce sulfur oxide and particulate emissions, is described. The curtailment plan considers a daily forecast of dispersive capability of the atmosphere for cities served by a pipeline system. Cities having the worst dispersive capability on a given day are not curtailed, while those with the best dispersive capability are curtailed. This air quality approach thus distributes the natural gas available on a given day to cities with the greatest need from an air quality standpoint. The ambient air quality of all cities on the worst air pollution days is improved, thereby improving the annual average ambient air quality of all cities. A computer simulation of this environmental approach to natural gas distribution versus a non-environmental approach over a 2-year period, assuming the availability of natural gas and 1% sulfur fuel oil, shows an improvement in peak pollution concentrations of 9-25% in eight out of 10 cases where the environmental approach is employed. The two remaining cases show improvements of 3-25% in most of the five highest pollutant concentrations (as measured by SOx) for two of four cities simulated.

47643 **APTIC NO. 75012**

Delyagin, G. N., V. I. Kirsanov, A. G. Onishchenko, and A. I. Gladkiy

COMBUSTION OF WATER-COAL SUSPENSIONS OF LEAN DONETS COAL IN AN INDUSTRIAL STEAM BOILER FIREBOX. *(Szhiganiye vodougol nykh suspenziy iz Donetskikh toshchikh ygley v topke promyshlennogo parovogo kotla). (Source not given.) 1973 (?). 4 refs. Translated from Russian, 21p.*

The combustion of water-coal suspensions was studied in a suspension preparation, storage and feed unit, and a combustion unit. The method was economical, reliable, and reduced pollution. The experiments and their results are discussed. The combustion products were analyzed and correlated with the composition of the coal and the operating conditions of the combustion. Suspensions of Donets lean coals can be prepared by wet grinding in a ball mill. With a moisture content of 45-50%, the suspension is easily transported by regular pipelines and can be stored without stratification in open storage containers. Atomization of lean coal suspensions by the burner unit must be finer than in combustion of gas coal suspensions. Jets with a baffle plate and compressed air feed were effective in atomization. For combustion of lean coal suspensions, the aerodynamic conditions of the preburner must provide intensive recirculation of the hot combustion products, from the lower part of the preburner to the base of the flame. It is advisable to use a burner unit with smooth regulation of the degree of twist of the primary air. As wide as possible an expansion angle of the burner ports is necessary. Combustion of lean coal suspensions in the test furnace differs from combustion of gas coal suspensions, mainly by a reduction in evolution of heat in the initial combustion zone. Donets lean coal suspensions burn with a high degree of fuel burn-up, with an excess air ratio close to unit. With the degree of fuel burn-up of 84% within the preburner and an excess air ratio equal to 0.98, the heat losses from chemical incompleteness of combustion is practically equal to zero. Losses with flue gases, with adequate sealing of the boiler enclosure, are less than or equal to 12.7%. A boiler efficiency equal to 75% was obtained in the test. In normal operation the efficiency of an industrial steam boiler with this furnace arrangement can reach 80-82%. This method can be used to burn water-coal suspensions obtained from flotation cleaning of coal.

47644 **APTIC NO. 69823**

Dibbs, H. P. and P. Marier

METHODS FOR THE REMOVAL OF SULPHUR FROM COAL. *Air Pollution Control Directorate, Ottawa (Ontario), Engineering Div., Tech. Appraisal Rept.. Environmental Protection Service 3-AP-73-3, 67p., March 1973. 136 refs.*

Methods for the removal of sulfur from coal prior to combustion are reviewed. Pyritic S from coal may be completely removed either by the dissolution of the coal in an organic solvent, followed by filtration to remove inorganic materials and the subsequent re-constitution of the hydrocarbon phase, or by methods based upon the selective chemical leaching of pyrite from the coal matrix. These methods are in the development stage and only the solvent refined coal process is being scaled-up to the pilot-plant level. Only coals containing 1 to 1.5% S can be economically desulfurized by physical techniques to levels necessary to meet emission standards of the type proposed in the United States. The main benefit of the cleaning methods for high S coals is as a primary upgrading step which allows the partially desulfurized coals to be used in conjunction with relatively low efficiency treatment methods for the removal of sulfur dioxide from flue gases. (Author summary modified)

47645 **APTIC NO. 67093**

Emukai, Naomi and Nobuo Inagaki

H2S and SO2 REMOVAL BY CHARCOAL FILTERING. *Rev. Elect. Commun. Lab., 21(5-6):384-390, May-June 1973. 3 refs.*

In order to determine the efficiency and optimum application condition of charcoal filtering, the effects of various factors, such as filter thickness and humidity, on the purification ratio were investigated in a study of hydrogen sulfide and sulfur dioxide removal by charcoal filtering. The H2S and SO2 reaction mechanism and kinetics at the charcoal surface are discussed. The catalytic chemical reaction probably occurs in an SO2 environment, following the SO2 dissolving in the water condensed in the pores; the reaction rate is determined by the SO2 diffusion through the water. The H2S reaction is probably chemisorption. According to this point of view, the effects of the humidity, air flow through the filter, and dust on the purification ratio are successfully explained. (Author abstract modified)

47646 **APTIC NO. 69545**

Gary, James H., R. M. Baldwin, C. Y. Bao, M. Kirchner, and J. O. Golden

REMOVAL OF SULFUR FROM COAL BY TREATMENT WITH HYDROGEN. PHASE I: THE EFFECT OF OPERATING VARIABLES AND RAW MATERIAL PROPERTIES. *Colorado School of Mines, Golden, Colo., Chemical and Petroleum Refining Engineering Dept., Office of Coal Research Contract 14-32-0001-1225, Research and Development Rept. 77, Interim Rept. 1, 108p., May 30, 1973. 47 refs.*

The process variables reaction temperture, pressure, reaction time, solvent type, and solvent to coal ratio were studied for their effect on the desulfurization of coal by hydrogen treatment. The process under consideration consisted of reacting a coal- solvent slurry with hydrogen at elevated temperatures and pressures in a batch autoclave rocking bomb reactor. Vacuum distillation was used to recover the solvent, resulting in a solid low-sulfur coal product. Both solvent type and temperature were very highly significant variables (99% confidence level) in the solvent refining process for the desulfurization of coal. Some signifcance (90% confidence level) of the solvent to coal ratio was demonstrated for the sub-bituminous coals. Anthracene oil was a better solvent for the process than tetralin since the dissolution of the coal in anthracene was greater and the hydrogen transfer characteristics appeared to be better in comparison to the tetralin. Inorganic sulfur was easily removed from the raw coal by the solvent refining technique (98%), while organic sulfur was removed to a lesser degree (81%). The degree of dissolution and depolymerization of the coal in the solvent was an important process factor for overall desulfurization. (Author abstract modified)

47647 **APTIC NO. 75010**

Hassel, D. (ed.)

ON THE ROAD TO TOMORROW S AUTOMOBILE. *(Auf dem Weg zum Auto von morgen). Federal Ministry of Research and Technology (West Germany) and Rheinland Test Code Assoc. (West Germany), New Engines Catal. Semin., Cologne, West Germany, 1973, 256p., 33 refs. (Nov. 14.) Translated from German, 234p.*

A number of papers are included on methods of controlling automotive exhaust emissions. The effects and interactions of fuel mixture composition, mixture preparation, ignition, exhaust recycling, and thermal-catalytic treatment of exhaust gases with respect to minimum emission of harmful substances from Otto engines are discussed. Soot and odor elimination and the reduction of harmful and solid substances emitted by vehicle diesel engines are described. Stratified charge engines are also discussed, including several low-emission engines. A gas turbine energy conversion system is described in another paper. Basic research on discharge processes in spark plugs, ultrasonic fuel vaporization, reaction-kinetic processes in combustion engines, and compact gas generators are the subjects of other papers. A systems analysis of power aggregates is described. Research in catalysts for catalytic afterburners is described including development of a ceramic carrier material, production of a single-piece honeycomb body suitable as a catalyst carrier, development of base metal catalysts, and research on catalytic cleaning of automotive exhaust gases.

47648 **APTIC NO. 67083**

Henry, J. M., C. R. McCann, J. J. Demeter, and D. Bienstock

NOX CONTROL BY FLUE GAS RECIRCULATION IN PULVERIZED FUEL COMBUSTION. *Preprint, American Inst. of Chemical Engineers, New York, 12p., 1973. 8 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa.. Nov. 11-15, 1973.)*

Experiments on flue gas recirculation in a pulverized fuel furnace are discussed. The recirculation was effective in reducing nitrogen oxide emissions. The furnace burned 500 lbs of coal/hr and simulated the operation of large industrial and utility boilers. Flue gas was cooled to 350 F and recirculated into the flame zone in the range of 7 to 33% of the input air supply. Nitrogen oxide emissions with no flue gas recirculation were 1.44 g/10 to the 6th power cal (calculated as nitrogen dioxide); with recirculation, reductions of 6-44% NOx emissions were observed. A mathematical model of the NOx chemistry of the furnace was examined in parallel with the experiments to determine the sensitivity of NOx emissions to flue gas recirculation. The observed emission reduction was much less than predicted by the kinetics of atmospheric nitrogen oxidation at flame temperatures. (Author abstract modified)

47649 **APTIC NO. 69674**

Hughes, J. M., M. P. Boyce, and V. Y. Welling

EXHAUST GAS POLLUTION CONTROL AT THE LAREDO, TEXAS BORDER INSPECTION STATION. *American Society of Mechanical Engineers, New York, Am. Soc. Mech. Engrs. Meet., Flow Stud. Air Water Pollut., 1973, p. 173-182. 7 refs.*

The optimum way to minimize exhaust gas concentrations under the 85 by 220 foot canopy at the customs station in Laredo, Texas was studied. Peak concentrations of over 100 ppm carbon monoxide were measured which constituted a health hazard. Similarity parameters were identified from governing equations, and various ventilation concepts were studied using a scale model of the station in a wind tunnel. The flow patterns at the customs station were correlated with those in the model. The optimum ventilation system was a combination of two of the ventilation concepts tested. The forced air system on the east side of the canopy at the driveway level was the most effective of the ventilation concepts investigated. It removed contaminated air from the canopy and was not adversely affected by wind direction changes. The system combined with the air curtain forced air system was most effective in clearing contaminated air from the canopy. A titanium tetrachloride smoke tracer technique and a video tape recorder system were used to test the efficiency of the control methods. Part of the recommended ventilation system was installed at Laredo with subsequent air quality improvement. (Author abstract modified)

47650 **APTIC NO. 67110**

Jones, Robert E.

ADVANCED TECHNOLOGY FOR REDUCING AIRCRAFT ENGINE POLLUTION. *Preprint, American Society of Mechanical Engineers, 21p., 1973. 16 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973.)*

Combustor research programs of the National Aeronautics and Space Administration are described in relation to proposed Environmental Protection Agency regulations covering emissions from aircraft gas turbine engines. In-house research with a swirl-can modular combustor and a double-annular combustor demonstrates significant reductions in nitrogen oxide levels. Research on the reduction of idle emissions includes the conversion of conventional duplex fuel nozzles to air-assisted nozzles and an exploration of the potential improvements possible with fuel staging and variable combustor geometry. A major contracted effort is the Experimental Clean Combustor Program, the objective of which is to evaluate the potential emissions reduction of a wide variety of combustor designs; the program goal is a 75% or greater reduction in NOx emissions at take-off and a 50% reduction in the level of idle pollutants from present day levels for large turbofan engines. This effort is planned to be conducted in three phases consisting of combustor concept screening, combustor development, and full engine demonstration of the emissions reduction possible. (Author summary modified)

47651 **APTIC NO. 56505**

Kasihara, Masao

THE EXISTING STATUS ON POLLUTION CONTROL EQUIPMENT IN MURORAN PLANT. *(Nippon Seikosho Muroran Seisakusho kogai boshi shisetsu no jokyo ni tsuite). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Contr., 26(84):25-28, Jan. 1973.*

Low-sulfur heavy oil is used for heating furnaces and boilers to reduce sulfur oxide emissions in the Muroran steel plant. In Hokkaido, SOx concentrations were 0.025 ppm, half of the environmental standard (0.05 ppm). The telemeter at the front of the factory indicated 1-hour values above these. Large electrostatic precipitators were installed on a steel-making electric furnace, bag filters on 10 and 25 ton electric furnaces, and dry electrostatic precipitators on 100 and 120 ton furnaces. These electric collectors collect 300 tons of dust per month. The dust is discarded after being formed into a granular shape by a pelletizer. Dust in Hokkaido averaged 10 tons/mo.

47652 **APTIC NO. 75019**

Kirsanova, O. P. and L. V. Semenov

ECONOMIC EFFECTIVENESS OF DIRECT COMBUSTION OF WATERED FUELS AT THE MAGNITOGORSK CENTRAL ELECTRIC POWER STATION. *(Ekonomicheskaya effektivnost pryamogo szhiganiya obvodnennykh topliv na Magnitogorskoy TsES). Inst. of Fossil Fuels (USSR), p. 34-44, 1973 (?). 6 refs. Translated from Russian, 23p.*

The economic effectiveness of the direct combustion of watered fuels at the Magnitogorsk Central Electric Power Station was studied. Water-coal suspensions and watered coal fines can be obtained from the hydraulic extraction of the fuel and from flotation of coal for cleaning. Dewatering and drying of coals in open settling tanks takes a long period of time, and disposal of the wastes causes the loss of millions of tons of coal. With the direct combustion of watered fuel as water-coal suspensions, there is no longer any necessity for intense dewatering and drying of fuel, and the losses of coal and storage and recharging of coal fines and slurries are eliminated. Specific capital investments per ton of steam are much lower when the electric power station boilers are fired with coal-water suspensions than when powdered fuel is used. These outlays will be two to three times lower when a mixture of intermediate product, slurry, and flotation tailings is burned; three to six times lower when use is made of a mixture of slurry and flotation tailings; and three times lower when the intermediate product, or a mixture of the intermediate product and flotation tailings is used. The specific operating costs when generating steam on the average got all the schemes of fuel combustion considered are approximately 2.5 times lower when used in the form of coal-water suspensions than when schemes for preparing fuel for powdered combustion are employed. The total operating costs for generating steam in the variants under which the initial fuel is a mixture of all coal dressing wastes or of the intermediate product and the flotation tailings are approximately at the same level. Use in the electric power station boilers of the suspensions is 20-30% more economical than burning them dry (after dewatering and drying). The prorated outlays are 2.5-4.0 times lower when the preparation and combustion of this fuel by the direct method is organized. The moisture content of the suspensions of 40-50% does not materially affect the operating economics of steam generation.

47653 **APTIC NO. 69435**

Kuhre, C. J. and J. A. Sykes, Jr.

CLEAN FUELS FROM LOW-PRICED CRUDES AND RESIDUES. *Preprint, American Inst. of Chemical Engineers, New York, 19p., 1973. 9 refs. (Presented at the American Institue of Chemical Engineers National Meeting, 74th, New Orleans, La., March 11-15, 1973.)*

The Shell Gasification Process (SGP) for converting high sulfur residual fuels and heavy crudes to clean, low-sulfur fuels is described. Thy process is carried out by injecting oil and air (or oxygen) through a specially designed burner assembly into a closed combustion vessel where partial oxidation occurs at about 2400 F. The hot reactor-effluent gas containing some of the ash from the feed and 1-3% by weight of the hydrocarbon feed as soot is passed to a specially designed waste-heat boiler which produces high pressure steam. The crude gas leaving the waste- heat boiler and its economizer at temperatures around 225 F is next passed to a carbon removal system. The product gas is virtually free of carbon (less than 5 ppm), ash, and any other particulates. The process thus produces three net products: high pressure steam, clean waste water, and carbon-free fuel gas. Sulfur in the feedstock is converted primarily to hydrogen sulfide and carbonyl sulfide which are easily removed from the clean gases by conventional desulfurization processes. Nitrogen in the feedstock is almost entirely converted to the elemental form. The final product gas is a mixture of hydrogen and carbon monoxide in inert gases.

47654 **APTIC NO. 65362**

Laatsch, Fritz

INCINERATOR FOR INDUSTRIAL WASTE HAS AFTERBURNER CHAMBERS. *(Verbrennungsofen fuer Abfaelle, insbesondere Industrieabfaelle). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,164,663. 4p., July 5, 1973. 4 refs. (3 claims).*

Gas-tight partitions extend between the combustion chamber and the afterburner chamber(s); the outer channels open into the afterburner chamber(s) at 90 degrees to the direction of gas take-off from them, and are directed toward the flames of the additional burner. In succession upward, the chambers are followed by a trickle scrubber for the flue gases, and a chimney.

47655 **APTIC NO. 66759**

LaMantia, Charles R., Richard R. Lunt, and I. S. Shah

DUAL ALKALI PROCESS FOR SO2 CONTROL. *Preprint, American Inst. of Chemical Engineers, New York, 23p., 1973. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 15, 1973, Paper 25c.)*

Laboratory and pilot plant development of a dual alkali process for sulfur dioxide control is described. The process involves sodium- based absorption of SO2 followed by reaction outside the scrubber with lime and/or limestone to produce a solid calcium sulfite/sulfate waste and a regenerated sodium scrubber feed solution. Pilot plant tests using the combustion flue gas from a natural gas fired hot air furnace with spiked SO2 concentrations show that one of the most important advantages of Na solution scrubbing of SO2 is the potentially high SO2 removal capability. A plot of overall SO2 removal versus feed stoichiometry for a venturi-two tray configuration indicates that better than 90% removal efficiency can be achieved with system stoichiometries as low as 1.4. Sulfite oxidation to sulfate occurs principally in the scrubber, with the observed rate of sulfate formation being a function of active Na concentration for the scrubber. The maximum observed oxidation level corresponds to an SO2 oxidation level of 9-10% for 90% SO2 removal from a gas containing 2500 ppm SO2; oxidation rate can be reduced by as much as 60% by appropriately adjusting process liquor conditions. Generally, SO2 absorption varies from 86-95% depending upon operating conditions and is limited only by the scrubber feed stoichiometry. Lime utilizations vary from 95-98%, and the settling and filtration characteristics of the generated solids are consistently good.

47656 APTIC NO. 69931

Lewis, Clifford J. and P. E. Jeffers

NEW CONCEPT FOR SCRUBBING GASES. *Brick Clay Rec., 162(6):34-36, June 1973.*

A pilot plant is described which was successful in removing up to 95% of the sulfur dioxide from coal-burning gases. The scrubber also removed 50-65% of the nitrogen oxides and 85% of the particulates. Generally, slightly greater efficiency in lime usage and SO2 removal was achieved by recycling about 50% of the discharged sludge and adding fresh lime slurry feed to it. About 1.2 lbs of slaked lime could be expected to remove 1 lb of SO2. The process is based on a rotary device using a slaked lime slurry. The process is free of scale and build-up and can be used with ceramic kilns. (Author abstract modified)

47657 APTIC NO. 70138

Mannion, W. A., K. Aykan, J. G. Cohn, C. E. Thompson, and J. J. Mooney

CATALYTIC REDUCTION OF OXIDES OF NITROGEN EMISSIONS IN AUTO EXHAUST GAS. *Preprint, Engelhard Minerals and Chemicals Corp. Engelhard Industries Div., Menlo Park, N. J., 23p., 1973 (?). 14 refs.*

The program made in developing catalysts for use in the control of nitrogen oxides from automotive exhaust is discussed. A stabilized supported ruthenium catalyst for use as the nitrogen oxides reduction bed in a dual-bed system was evaluated in laboratory bench tests and on an engine dynamometer with lead sterile and unleaded fuel (0.035 g lead/gallon, 340 ppm sulfur). Exposing the catalyst to high temperature lean operation on an engine- dynamometer showed that the catalyst was not completely stable to such an environment. An initial evaluation of three-way conversion catalyst showed that good conversion of carbon monoxide, hydrocarbons, and nitrogen oxides was maintained after exposure to elevated temperatures under oxidizing conditions using unleaded fuel. (Author abstract)

47658 APTIC NO. 67088

McConnell, R. J. and T. F. McDonnell

FUEL AND LUBRICANT EFFECTS ON OXIDIZING CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1973. 8 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering, Meeting, Detroit, Mich., May 14-18, 1973, Paper 730597.)*

The loss of efficiency of oxidizing catalysts, which probably will be required in the future to meet vehicle emission control standards, was studied in engine dynamometer tests and in vehicles operated under customer service driving conditions. Zinc, barium, calcium, and magnesium additives in engine oils and the sulfur level in the fuel do not have an apparent effect on catalyst deterioration. Low levels of lead and phosphorus (0.05 g/gal Pb and 0.03 g/gal Pb plus 0.005 g/gal P) in fuel did have an apparent effect. Additives in SE engine oils A, B, and C did not give significant greater deterioration effects than the ashless oil. (Author abstract modified)

47659 APTIC NO. 70137

McDonnell, T. F., R. J. McConnell, and K. Otto

FUEL CHARACTERISTICS FOR 1975-76 PASSENGER CARS AND LIGHT TRUCKS. *Preprint, American Petroleum Inst., Div. of Refining, 46p., 1973. 10 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 38th, Philadelphia, Pa., May 15, 1973.)*

Quantitative information to predict deterioration factors for different lead levels in gasoline when using a noble metal oxidation catalyst is presented. The maximum trace lead level for unleaded gasoline has been set at 0.05 g/gal of lead. Fuels containing a minimum of 0.03 g/gal lead are to be used by manufacturers for mileage accumulation of 1975-model-year durability and emission data vehicles. Reasonable correlation of the effects of fuel lead concentration on deterioration of noble metal catalysts has been obtained between field durability tests and engine dynamometer or laboratory durability tests. Some catalyst deterioration was evident at 24,000 miles with fuel containing less than .003 g/gal lead. A significant increase in catalyst deterioration occurred at 24,000 miles with fuels containing 0.03, 0.05, and 0.10 g/gal lead relaive to the less than .0003 g/gal lead gasoline. (Author conclusions)

47660 APTIC NO. 69555

Nottes, Guenter and Heinz Nohe

MOTOR FUELS CONTAINING POLYCARBOXYLIC ACID DERIVATIVES. *(Treibstoffe fuer Ottomotoren, enthaltend nichtaromatische cyclische Carbonsauereester). Text in German. (BASF AG, Ludwigshafen (Germany)) W. Ger. Pat. Appl. 2,304,068. 3p., Jan. 27, 1973. 1 ref. (4 claims).*

Fuel for Otto-cycle engines contains 5-2000 ppm, preferably 50-500 ppm, of an ester of formula:A-(COOR) subscript m (where A is the hydrocarbon residue of mono-, bi- or tricyclic non-aromatic carboxylic acid; R is the residue of 3-18 C alcohols; and m equals 3-6). Preferable additives are bicyclooctenetetracarboxylic acid-tetra-2-ethylhexyl ester or cyclohexanehexacarboxylic acid-hexa-2-ethylhexyl ester. The additive keeps the carburetor clean and thereby keeps a high carbon dioxide to carbon monoxide ratio in the exhaust gas.

47661 APTIC NO. 66760

O Hara, J. B., N. E. Jentz, S. N. Rippee, and E. A. Mills

PRELIMINARY DESIGN OF A PLANT TO PRODUCE CLEAN BOILER FUELS FROM COAL. *Preprint, American Inst. of Chemical Engineers, New York, 29p., 1973. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov 15, 1973.)*

Results are presented from a study summarizing the preliminary design and estimated capital investment for a demonstration-scale plant to produce clean boiler fuels from coal. The plant will contain two primary process units: a modified solvent refined coal unit and a gasifier unit to produce syngas. The complex is designed to charge 10,000 tons/day of coal to produce two low- sulfur liquid fuel streams as its major products. The two forms of fuel will consist of a liquid product containing approximately 0.5 wt% S, sufficient to fuel oil product containing 0.2 wt% S, sufficient to fuel a 200 MW power plant. By-products consist of hydrotreated naphtha and S recovered from the various desulfurizing processes. The plant is also capable of converting the gas streams to produce approximately 67 million cu ft/day of synthetic natural gas in the case of an alternate product objective. Fixed capital investment is estimated at $270,000,000.

47662 **APTIC NO. 67131**

Patel, Nitin R.

OPTIMAL CONTROL OF SULFUR DIOXIDE EMISSIONS AT POWER STATIONS: MODELS AND A CASE STUDY. *Massachusetts Inst. of Tech., Cambridge, Mass., Operations Research Center, Army Contract DAHCO4-73-COO32, Program Element P-9239-M, TR 82, MIT OSP 81219, ARO 9239.10, 126p., Sept. 1973. 45 refs.*

NTIS, DDC: AD 775392

Dynamic emission controls for power stations which depend upon meteorological conditions and selective fuel burning are analyzed and contrasted with fixed controls. A meteorological model is developed to relate source emissions with average pollutant concentration in a region under different meteorological conditions, and the problem of determining optimal dynamic controls for sulfur dioxide emissions at fossil-fueled power stations is treated by constructing a linear programming model. The model is extended to encompass seasonal control of sources which are not amenable to more frequent controls; another extension is constructed to analyze the effects of errors in meteorological forecasts. The various models are applied to the Metropolitan Boston Air Pollution Control District, and the results show substantial savings from dynamic as compared to static controls. The impact of dynamic emission controls on new site selection for fossil-fueled power stations is examined, and a stochastric linear programming formulation is developed along with an algorithm for solving the linear programming problem. (Author abstract modified)

47663 **APTIC NO. 69339**

Peredi, Jozsef and Anna F. Ruzics

METHODS FOR THE INHIBITION OF AIR CONTAMINATION BY OFFENSIVE ODORS FROM FAT PRODUCING PLANTS. *(Modszerek a levego buzszennyezodesenek megakadalyozasara zsiradekipari uzemekben). Text in Hungarian. Elelmezesi Ipar, 27(6):167-171, 1973. 10 refs.*

Methods for the deodorization of waste gases, steam, and water from oil and fat processing plants are described. Fats and other materials of animal origin release malodorous substances, such as putrescin, cadaverin, and skatole, as well as fatty acids, carbonyls, and aliphatic aldehydes. Malodorous substances present in air can be removed by adsorption on activated carbon, but the adsorption becomes reversible in the presence of steam and at high temperature. Steam containing malodorous substances is best deodorized by condensation of the steam and subsequent deodorization of both the remaining air and of the condensed water in chlorine-containing water. Chemical absorption in liquids is also suitable for deodorization. Thermal, and especially catalytic incineration are highly effective in the destruction of malodorous substances in air. Malodorous waste gases can be directly admitted to the combustion air of boilers. Catalytic incineration is usually conducted at 300-500 C in the presence of platinum, silver oxide, or copper oxide catalyst.

47664 **APTIC NO. 69900**

Prado, J. E. Gonzalez de, L. Gonzales Tejuca, J. A. Pajares, and J. A. Soria

ADSORPTION OF CARBON MONOXIDE ON SCANDIUM OXIDE. *(Adsorcion de monoxido de carbono sobre oxido de escandio). Text in Spanish. Acta Cient. Venez., 24(S2):189-194, 1973. 27 refs.*

Adsorption isotherms of carbon monoxide on scandium trioxide in the range -196 to 500 C were measured, with 1.5 torr as the highest pressure. Samples with 17 sq m/g BET specific surface were heated for 4 hr in air at 700 C, then reduced in carbon monoxide at 550 C for 24 hr, and finally evacuated for another 24 hr at 550 C prior to each experiment. Isobars presented a maximum at 200 C. At temperatures below 200 C, the isotherms fit the Freundlich equation, indicating that the process was controlled by surface heterogeneity; the maximum coverage corresponded to the adsorption of 0.6 CO molecules on every surface cation. Isoteric adsorption heats ranged from 2.5 kcal/mol at room temperature; the heats were characteristic of physical adsorption or weak chemisorption. At temperatures above 200 C, carbon dioxide was chromatographically detected in the desorption products, probably produced by the reaction of adsorbed CO with surface oxygen. The isotherms followed a Langmuir adsorption equation; the calculated Langmuir monolayer was of 4.2 times 10 to the 15th molecule/sq m at 500 C, which corresponded to less than 0.1% of the surface anions. Infrared spectra at room temperature showed no chemisorption of CO; at 200 C there was some evidence of CO2 formation and existence of a stronger chemisorption.

47665 **APTIC NO. 65750**

Prugar, Eryk

EVALUATION OF CHANGES IN THE CONSTRUCTION OF MOTORCAR SPARK IGNITION ENGINES AS A RESULT OF LEGISLATION CONCERNING THE PROTECTION OF NATURAL HUMAN ENVIRONMENT. *(Ocena zmian wprowadzanych w konstrukcji samochodowych silnikow spalinowych z zaplonem iskrowym w wyniku oddzialywania ustawodawstwa o ochronie naturalnego srodowiska czlowieka). Text in Polish. Zesz. Nauk. Politech. Slask. Energ., 58(376):5-31, 1973.*

The changes made in the construction of automobile spark ignition engines are evaluated in the light of new legislation meant to protect the human environment from noxious compounds of fumes emitted to the atmosphere. California Test standards worked out by the Motor Vehicle Pollution Control Board in 1961 are presented. The rules state permissible carbon monoxide, nitric oxides, and hydrocarbon emissions to the air. The suggested values for 1973 are, respectively, 23; 1.3; and 1.5 g/mi; and up to 12; 0.7-1.0; and 0.5-0.8 g/mi in 1975. The regulations give the following lead content in fuels with 90 to 96 octanes: 0.13 g/l until July 1, 1971, and no lead content until July 1, 1974, 1975, and 1977. The lead content of fuels higher than 96 g/l should be 0.80; 0.80; 0.53 g/l; and no content until, respectively, July 1, 1971; 1974; 1975; and 1977. Present and future engine design and operation modifications are reviewed.

47666 **APTIC NO. 69779**

Rankine, Robin P., Rich K. Kerr, and Harold G. Paskall

POTENTIAL EFFICIENCIES OF THE CONVENTIONAL CLAUS SULPHUR RECOVERY PROCESS. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta. p. 17-24. 6 refs. (Nov. 1-2.)*

The latest advances in Claus process technology are discussed in the light of recent theoretical predictions together with supporting evidence obtained in the field. Unprecedented efficiency levels can be achieved by conventional Claus sulfur recovery plants employing as few as two catalytic stages. However, to sustain high level efficiencies for extended periods of time, persistent catalyst deactivation problems must be solved. Theoretical predictions of the thermodynamics of the Claus process and of optimization of the process are compared with field experiments at a major Claus plant operating in Alberta. The field data indicated that theoretical thermodynamic calculation for molecular sulfur vapor and the free energy minimization program accurately predict the behavior of Claus units. Accurate predictions were also obtained in bench scale laboratory studies. Claus sulfur plants can attain recovery efficiencies in the 99+% region. These recoveries are sufficiently high to satisfy all present governmental requirements. (Author abstract modified)

47667 **APTIC NO. 69421**

Stolfa, Frank, R. H. Jensen, and C. W. Selvidge

LOW SULFUR RESIDUAL FUELS BY RCD ISOMAX. *Preprint, American Inst. of Chemical Engineers, New York, 26p., 1973. 4 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 11-15, 1973.)*

Commercial and pilot plant operations of a residual hydrodesulfurization scheme (fixed bed) known as the RCD Isomax process are reviewed. The hydrodesulfurization scheme is capable of reducing a 4.0 wt% sulfur Middle East crude to a product range of 1.0-1.5 wt% sulfur and can be extended to produce heavy fuel oils having sulfur levels as low as 0.3 wt% sulfur. Pilot plant data indicate the feasibility of processing residuals on a 1-year cycle without regeneration or skimming. Pilot plant studies also demonstrate the capability of a newly developed catalyst for reducing Kuwait crude to 0.7% sulfur at existing commercial operating conditions. A modified RCD Isomax process that can effectively take advantage of any future catalyst technology appears capable of desulfurizing Kuwait type crudes to 0.3% sulfur. Only 50% more catalyst is required for this reduction as compared to reductions to 1.0% sulfur and the initial temperature requirement is the same.

47668 **APTIC NO. 69992**

Stone, Charles William

ECONOMICALLY OPTIMAL DESIGN OF PARTICULATE AIR POLLUTANT CONTROL EQUIPMENT. *Illinois Univ. at Urbana-Champaign, Urbana, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 147p., 1973. 61 refs.*

Economically optimal pollution control equipment designs were developed for the electrostatic precipitator and the cyclone. The developed electrostatic precipitator model consists of three parts and represents a combination of theoretical and empirical equations and relationships which describe the economics and power requirements of the concentric cylinder electrostatic precipitator. Each of the parts is optimized individually and the resulting design relationships are used to find the optimal system design. The overall cyclone model is expressed entirely in terms of the number of cyclones in the system. Since the number of feasible cyclone units in the system is small, the economically optimal number of units and radius of each was found by implementing an exhaustive enumeration procedure over the entire range of n and selecting the minimum cost number. (Author summary modified)

47669 **APTIC NO. 66746**

Strom, S. S. and W. Downs

A SYSTEMATIC APPROACH TO LIMESTONE SCRUBBING. *Preprint, American Inst. of Chemical Engineers, New York, 15p., 1973. 12 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa. Nov. 11-15, 1973.)*

Research and development of limestone scrubbing technology is reviewed in relation to the predictability of pilot and field test results by the use of mathematical models. A mathematical model for particulate collection is demonstrated, with one of the more significant consequences of the model being the implication that collection efficiency can be optimized for a fixed total energy level. Equations comprising a mechanism for SO2 absorption show that two parameters in the process appear to predominate: the volume of liquid retained in the column per molar flow rate of flue gas and the concentration of calcium carbonate surface. Pilot plant absorption data indicate that, irrespective of tray design, liquid holdup can be predicted as a function of countercurrent tray absorber pressure drop. Comparisons of absorption field data with absorption pilot plant data indicate a lower degree of correlation for the former with predicted values; possible explanations include: lack of precise input data to the SO2 absorption model, potential scaleup problems for which the mode does not account, and chemical effects such as binding of the limestone surface.

47670 **APTIC NO. 67121**

Thielke, John Ferdinand

AN APPROACH FOR OPTIMIZING LONG RANGE AIR POLLUTION CONTROL STRATEGIES FOR MAJOR POINT SOURCES IN A GROWING URBAN INDUSTRIAL AREA. *Washington Univ., Seattle, Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 283p. 31 refs.*

An approach for determining optimal air pollution control strategies for major point source emission sources of suspended particulate matter in a geographically small but growing urban industrial region is provided in which a set of strategies which achieves and maintains concentrations below the standard at the least total control cost over time is defined and selected. Dynamic programming, an optimization technique, provides the basis for identifying an optimal sequence of control levels over time for each source. Computer simulation of the air pollution process as a dynamic system includes the coupling together of an air quality dispersion model, and atmospheric emission model, and an industrial employment growth and allocation model along with a control model in addition to the optimization procedures. The approach appears capable of examining the impact of potential urban industrial growth in terms of control costs necessary to achieve given air quality standards.

47671 **APTIC NO. 69829**

Urban, Charles M., Karl J. Springer, and Daniel A. Montalvo

EMISSIONS CONTROL TECHNOLOGY ASSESSMENT OF HEAVY DUTY VEHICLE ENGINES (FINAL REPORT). *Southwest Research Inst., San Antonio, Tex., Office of Air and Waste Management Contract 68-01-0472, Rept. EPA-460/3-74-007, AR933, 634p., Dec. 1973. 54 refs.*

NTIS: PB 236899/AS

Reductions in exhaust emission levels from gasoline and diesel engines used in heavy-duty vehicles (over 14,000 lb) were investigated for various control techniques. A total of eight gasoline engines and one diesel engine were evaluated in dynamometer tests. Two of the gasoline engines were evaluated parametrically, resulting in an oxidation and reduction catalyst best combination configuration; four were evaluated in an exhaust gas recirculation plus oxidation catalyst configuration, and two were involved in baseline tests. The one diesel engine was evaluated in an EGR plus oxidation catalyst best combination configuration. Emissions were measured by the 1975 Federal Procedure normally used for certification of cars and light trucks below 6000 lb to investigate transient vehicle operation. The oxidation catalyst reduced the nine-mode composite emissions of hydrocarbons and carbon monoxide an average of over 90%. Reduction in composite nitrogen dioxide emissions using EGR varied greatly; overall average reduction of NO2 with EGR (best combination) was approximately 45% in the nine-mode procedure. Hydrocarbons were reduced 90% in the 23-mode procedure, but CO reductions varied from 50-90%, depending on the gasoline engine tested. The best combination configuration (EGR, timing retard, and oxidation catalysts) for the diesel engine resulted in reductions of 82, 87, and 44% for hydrocarbons, CO, and NO2, respectively, in the 13-mode procedure.

47672 **APTIC NO. 70102**

Walsh, Michael A. and James R. Katzer

CATALYTIC OXIDATION OF PHENOL IN DILUTE CONCENTRATION IN AIR. *Ind. Eng. Chem. Process Design Develop., 12(4):477-481, 1973. 27 refs.*

The varpor-phase oxidation of phenol at concentrations from 875 to 26 ppm (vol) over copper oxide on alumina was studied in a fixed-bed tubular reactor between 150 and 270 deg in the presence of 8.4 to 13.4 mol % water vapor. Catechol, hydroquinone, and organic acids, which are reported to form in appreciable quantities in the homogeneous oxidation of phenol, were not observed in the vapor-phase catalytic oxidation. Organic intermediates, probably o- and p-benzoquinone, occurred in appreciable quantities in the catalytic oxidation at intermediate phenol conversions. At moderate temperatures (approximately 250 deg) and low conversions (approximately 30%), approximately 1/2 of the phenol oxidized was converted completely to carbon dioxide and water. This indicated that ring opening was a relatively difficult step in the reaction network. The vapor-phase oxidation was first order with respect to phenol over the range of conditions studied and exhibited an Arrhenius activation energy of 10 kcal/mol. (Author abstract)

47673 **APTIC NO. 67091**

Woods, R. L.

A FLUIDIC FUEL-INJECTION SYSTEM UTILIZING AIR MODULATION. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1974. 44 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/Fics-3.)*

A unique approach to fuel management systems applicable to spark ignition engines is discussed. In this air-modulation system, the operator controls the fuel consumption directly, as well as the control circuit schedules and the air consumption. This approach is opposite to existing systems and provides many desirable inherent features that have to be built as auxiliary circuits on conventional systems. This approach to fuel management could help reduce emissions, increase drivability, and is very well suited for fluidic control. The bench test results of a prototype system are presented. A review of previous fluidic fuel management projects is also given, including carburetor enhancement devices, continuous-fuel injection systems, and pulsed fuel-injection systems. (Author abstract modified)

47674 **APTIC NO. 68404**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME I. EXECUTIVE SUMMARY (FINAL REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-a, 49p., July 1973. 16 refs.*

NTIS: PB 225024/9AS

The general objectives, approach, and results of a computerized modeling study of the effect of mandatory engine maintenance on reducing vehicle exhaust emissions are presented. The model is capable of evaluating a broad spectrum of vehicle inspection and maintenance procedures for assisting regional planners in evaluating such programs as part of their plan to achieve ambient air quality goals. Supporting experimental programs for the model consist of the following: a survey to establish the frequency and extent of engine maladjustments and malfunctions in user vehicle populations, experiments to establish the influence of selected engine adjustments and states of component degradation upon vehicle exhaust mass emission rates, experiments to estimate the rates with which engine adjustments and exhaust emissions deteriorate with vehicle use, and a survey to establish the effectiveness with which garages diagnose and repair those engine malfunctions and maladjustments found to be important in an inspection and maintenance program. Hydrocarbon and carbon monoxide emission reductions ranging from 5-10% are predicted for inspection and maintenance programs which have been optimized for their cost effectiveness.

47675 **APTIC NO. 69477**

General Motors Corp.

CONTROL OF REFUELING EMISSIONS. *Rept. API-4222, 59p., 1973 (?). 6 refs.*

The control of automobile refueling emissions is discussed. The control of refueling hydrocarbon emissions is technically feasible either by control hardware at the service station or on board the vehicle. Control on board the vehicle is practically applicable to new vehicles beginning some future model year. Either control approach involves substantial technology penalties beyond current hardware and both require some additional service station hardware. A service station control system is available which would impose control on the refueling emissions from all cars. It has potential for practical regionalization of control coupled with very rapid reduction in total refueling emissions. (Author conclusions modified)

47676 **APTIC NO. 69682**

Parsons (Ralph M.) Co., Los Angeles, Calif.

DEMONSTRATION PLANT - CLEAN BOILER FUELS FROM COAL - PRELIMINARY DESIGN/CAPITAL COST ESTIMATE - VOLUME II (FINAL REPORT). *Office of Coal Research Contract 14-32-0001-1234, Rept. OCR-82-Int., 52p., Dec. 21, 1973.*

NTIS: PB 234321

Unit cost tabulations and process flow diagrams are presented for a demonstration-scale plant with the capacity to process 10,000 tons of coal per day for the production of 25,000 barrels of liquid products. The primary products consist of two grades of clean boiler fuels, while secondary products are high-grade naphtha and sulfur. The clean boiler fuel plant complex is composed of three major parts: a coal preparation section, a coal liquefaction section, and a gasification section. The liquid fuel produced will consist of 0.5 wt% sulfur fuel sufficient for fueling a 400 MW power plant and a desulfurized distillate fuel oil product containing 0.2 wt% sulfur sufficient for fueling a 200 MW power plant. Process flow diagrams are given for the following sections of the operation: coal preparation, coal slurrying and pumping, coal liquefaction and filtration, coal liquefaction product distillation, dissolver acid gas removal, fuel oil hydrogenation, naphtha hydrogenation, fuel gas sulfur removal, gasification, acid gas removal, shift conversion, carbon dioxide removal, methanation, raw water treatment, process waste water treatment, and sour water stripping. The estimated total cost for the coal preparation plant is $3,100,000 and for the oxygen plant $12,400,000.

47677 **APTIC NO. 70037**

Soviet-American Working Group on Technological Methods of Preventing Air Pollution by Industrial Installations

METHODS OF CLEANING FLUE GASES IN FERROUS METALLURGY ENTERPRISES. *1973 (?). Translated from Russian, 24p.*

Various methods of cleaning flue gases from ferrous metallurgical processes are reviewed. Sinter production uses multiple cylones, scrubbers, and venturi scrubbers, to remove dust. A limestone scrubbing method has been developed to remove sulfur dioxide with an 85-92% efficiency. Open hearth production uses venturi scrubbers and electrostatic precipitators for gas cleaning. Nitrogen oxides are catalytically reduced. Converter production is completely equipped with venturi scrubbers for gas cleaning. Electric steel smelting is equipped mainly with wet gas scrubbers. Wet gas scrubbers with round venturi tubes and injection spraying are installed beyond the electric furnaces. Ferroalloy production uses venturi scrubbing for gas cleaning from closed furnaces. Open furnaces use venturi tubes, electrostatic precipitators, and multiple cyclones. A system consisting of a hollow scrubber, venturi tubes, and a wet electrostatic precipitator satisfactorily cleans blast furnace flue gases with comparatively low overpressure. Methods to remove carbon monoxide, sulfur oxides, nitrogen oxides, and other gases from the processes in ferrous plants are also reviewed, including improvement of operation and new industrial processes and plant designs. Methods for eliminating unclassified discharges and permissible concentrations of pollutants are also reviewed. Instruments used to measure pollutants, nomenclature for automatic monitoring methods, and a method for estimating the effectiveness of atmospheric protection measures and of estimating damage sustained as a result of pollution are mentioned.

47678 **APTIC NO. 75016**

Ingenieursbureau Dwars, Heederik and Verhey, B. V., Amersfoort (Netherlands)

FINAL REPORT OF THE PUTTING INTO OPERATION OF THE N.C.B. S PURIFICATION PLANT IN SON. *(Eindrapport inzake de inbedrijfstelling van de zuiveringsinstallatie van N.C.V. te Son). File 1-2216-01, Aug. 1973. Translated from Dutch, 8p.*

The purification plant of the N.C.B. destruction company was studied. The load on the plant was roughly 55,000-60,000 inhabitant equivalents. The water supply was about 2400 cu m/day. The effluent of the plant had low pollution (BOD 7 mg/l, N-(Kj) 38.9 mg/l). Eighty-two percent of the nitrogen was oxidized, 79% of the N2 was removed, and 99.2% of the BOD was removed. The ponds removed about 70% of the effluent s nitrogen, bringing the total nitrogen removal to about 95%. During a sampling of the effluent, odors were also measured. As the effluent progressed through the plant, the odor decreased in strength, and a musty odor was emitted by the final pond.

1972

47679 **APTIC NO. 69426**

Bishop, John W., Shelton Ehrlich, and John S. Gordon

DEVELOPMENT OF COAL FIRED FLUIDIZED-BED BOILERS. FINAL REPORT. VOLUME II. *Perathon Inc., Alexandria, Va., Pope, Evans and Robbins, Office of Coal Research Contract 14-01-0001-478, Rept. 36, 118p., 1972.*

NTIS: PB 234344; GPO

Design optimization criteria are presented for a coal-fired fluidized-bed boiler with integral sulfur dioxide abatement. The optimum arrangement involves four accessible combustion spaces, express gas flow, two controlled coal supply systems, 26 coal feeders, carbon recovery, SO2 abatement, and limestone regeneration. The delivered and erected cost of an optimized small utility boiler capable of 86-90% efficiency, meeting anticipated SO2 emission regulations with 3-5% sulfur coal, and delivering a small stream of 5-10% SO2 to a conventional acid plant or a relatively low gas flow scrubber is $1.47 million. Three basic systems are being proposed for large utility fluidized-bed boilers: units fired under atmospheric combustion pressure at low through-bed air/flue-gas velocity; atmosphere pressure combustion units operating at high through-bed air/flue gas velocities; and units fired under pressurized conditions (10-15 atmospheres of pressure). Configurations studied include the single-bed-level multiple combustion zone and stacked beds at multiple levels. The fluidized-bed boiler of 30-[illegible]0 megawatt range is estimated to cost about one-half of its pulverized coal equivalent.

47680 **APTIC NO. 66754**

Celenza, C. J.

DESIGNING A PLANT AIR MANAGEMENT SYSTEM. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 6, p. 281-311. 3 refs.*

The design of a plant air management system is examined in terms of surveying plant conditions, testing and data collection, establishing design criteria, evaluating pollution control systems, estimating relative economics, selecting the control system, and engineering and construction problems. Design criteria are developed from information obtained from the plant survey and data collection phases of the program, including considerations of meteorological effects, topography, the nature of the surrounding community, and state and local regulations. Characteristics of each of the plant s emissions are determined, with particular emphasis on establishing the variations in flow characteristics and volume. The required treatment is determined by establishing the permissible limits for the individual pollutant emissions, and control device selection is determined by considering the characteristics of the pollutants and the equipment. Control equipment for particulates include settling chambers, cyclones, impingement separators, centrifugal separators, bag filters, wet collectors, and electrostatic precipitators; while gaseous pollutants can be treated with gas scrubbers, adsorbers, incinerators, and condensers. The basis for economic evaluation involves a balance of capital and operating costs.

47681 **APTIC NO. 68320**

Dyck, A. W. J.

ESCANABA PULP MILL NEARING COMPLETION. *Am. Paper Ind., 54(2):10-18, Feb. 1972.*

The Escanaba pulp mill is described. It is designed to produce 600 tons of hardwood pulp or 500 tons of softwood pulp per day. The mill is scheduled for a late spring 1972 startup. The pulping procedures and equipment are generally conventional, but there is a departure from that of a conventional kraft mill in that all odoriferous condensibles and noncondensibles are collected and incinerated. No reducible sulfurous gases or vapors will be vented to the atmosphere, resulting in a lack of traditional odor problems. A minimum of particulates will be emitted because of the highly efficient electrostatic precipitator, venturi scrubber, and fly ash removal equipment for recovery waste gases, lime kiln exit gas, and bark burner waste gas, respectively. Effluent waste treatment will use clarification, biological treatment in a pond with adequate aeration, and secondary clarification. The various processes in the new plant are described.

47682 **APTIC NO. 69820**

Friend, M. J.

EVALUATION OF DIESEL ENGINE EXHAUST SMOKE SUPPRESSANTS. *National Research Council of Canada, Ottawa (Ontario), Div. of Mechanical Engineering, Rept. MP-60, 9p., June 1972.*

Results from an evaluation of 15 proprietary diesel fuel additives designed to reduce the smoke intensity in diesel engine exhaust are reported. Two dynamometer-mounted test engines were used, with engine operating conditions being selected for relatively high smoke levels. The testing procedure consisted of operating the engines at a fixed speed condition for approximately 2.5 hr using a standard fuel, followed directly by 2.5 hr of running using treated fuel. Only marginal improvements were observed in most cases. Substantial improvements were observed with two additives, and four additives resulted in reductions of smoke level from 3.50 to 2.16 and 3.55 to 2.70 smoke level units. Further studies with these two additives are currently underway using a 12-cylinder railroad diesel engine operating for extended periods.

47683 **APTIC NO. 69417**

Godsave, L. A. and M. K. Eyles

BP HAS DEVELOPED NEW RESIDUE DESULFURIZATION PROCESS. *Petrol. Petrochem. Int., 12(1):73-75, 1972.*

A new residual oil desulfurization process developed by British Petroleum is described. A 50,000 b/sd commercial unit is planned to reduce the sulfur content of Kuwait atmospheric residue from 1 to 1 wt%. Cost of such a unit is approximately $26 million inclusive of hydrogen and sulfur recovery costs. When power is available at 1.4 cents/kw-hr and fuel at $2.00/bbl, utilities costs will be about $0.12/bbl of desulfurized product. Operating costs amount to $0.52/bbl of desulfurized product. This figure does not allow any credit for fuel gas produced, sulfur recovery, or export steam from the hydrogen plant which could amount to as much as $0.18-20/bbl of product. The process has the following advantages: high desulfurization activity, high tolerance to metals accumulation, low cracking activity to give high fuel oil yields, low denitrogenation activity, low hydrogen consumption, and low catalyst cost. Results of pilot plant tests are presented. In desulfurizing Kuwait residue (3.87 wt% sulfur) to produce a 0.96 wt% sulfur product, a high fuel oil yield is obtained approaching 100 vol% on feedstock. The low level of cracking and low denitrogenation activity result in a low chemical hydrogen requirement of 500 scf/bbl. Results were achieved using a catalyst with high selectivity for desulfurization. Catalyst selection and clogging are discussed.

47684 **APTIC NO. 69982**

Gompf, Henry L.

EVALUATION OF VOR-AIR DEVICE, A RETROFIT EGR SYSTEM. *Environmental Protection Agency, Ann Arbor, Mich., Control Device Evaluation Section, Rept. APTD-1376, 6p., Aug. 1972.*

NTIS: PB 220001

An exhaust gas recirculation retrofit device developed by Vor-Air, Inc. was tested consisting of a simple recirculation device and an air-bleed system. The exhaust was picked up from the exhaust manifold and piped through a control valve to the PCV line for introduction into the intake manifold. In addition, filtered air from the ari cleaner housing was allowed to mix with the exhaust gas recirculation flow into the PCV line. Baseline and device tests were performed according to the 1972 Federal emission test procedure, using a 1970 Plymouth Valiant equipped with an automatic transmission and 225 CID six-cylinder engine. The Vor-Air system demonstrated significant control of nitrogen oxides. No adverse effect on hydrocarbon or carbon monoxide levels was detected. Optimization of the recirculation versus bleed air flow rates might lead to better overall emission control. The durability and driveability effects of the system should be quantified. (Author abstract)

47685 **APTIC NO. 69983**

Gompf, Henry L.

EVALUATION OF TECHNOL G, A FUEL ADDITIVE. *Environmental Protection Agency, Ann Arbor, Mich., Control Device Evaluation Section, Rept. APTD-1379, 7p., Aug. 1972.*

NTIS: PB 219396

Technol G, a fuel additive, was tested to confirm a reported 12% reduction in hydrocarbon and a 17% reduction in carbon monoxide levels from an automobile. The manufacturer recommends that Technol G be mixed with gasoline in the volumetric proportion of one part Technol G to every 1000 parts of gasoline. Baseline and additive tests were performed using a 1962 Chevrolet equipped with a 283 CID engine and automatic transmission. Technol G was added to Indolene 30 in the proportions recommended by the manufacturer. The vehicle was driven about 15 mi after fuel treatment to insure mixing and mixture delivery to the engine fuel system. All testing was performed in accordance with the 1975 Federal emission test procedure. No beneficial effects on HC or CO emissions were measured due to normal test variability masking. A small adverse effect on NOx emission was measured. Due to the low magnitude of the emission changes measured, a fleet evaluation would be necessary to definitely show the overall effect of Technol G. (Author abstract modified)

47686 **APTIC NO. 69316**

Groenendaal, W. and H. C. A. van Meurs

SHELL LAUNCHES ITS CLAUS OFF-GAS DESULFURIZATION PROCESS. *Petrol. Petrochem. Int., 12(9):54-56, 58, 1972. 3 refs.*

The Shell Flue Gas Desulfurization (SFGD) Process was developed for removal of sulfur oxides from flue gases originating from oil-fired boilers or furnaces. It can also be used to remove sulfur dioxide from Claus sulfur recovery tail gases if they are combined with boiler/furnace flue gases. For Claus tail gas only, the Shell Claus off-gas desulfurization process was developed. Claus unit operation and desulfurization by low temperature Claus processes and conversion/concentration processes are discussed. The new Shell process consists of a conversion/concentration process involving a reduction section and an amine absorption section. In the reduction section, all sulfur compounds and free sulfur are completely reduced to hydrogen sulfide with hydrogen, or hydrogen plus carbon monoxide, over a cobalt/molybdenum-on-alumina catalyst at a temperature of about 300 C. Extensive bench scale studies on the reduction system have been carried out. A life test of more than 4000 hr showed a stable activity of the reduction catalyst, which means that in commercial units, very long catalyst lives can be expected. The commercial feasibility of the reduction section was further demonstrated in the Godorf refinery of Deutsche Shell AG. More than 80 absorption units using alkanolamine (ADIP) solutions have been installed. Bench scale studies of the ADIP absorption units were compared to commercial experience. The total capital investment of the new Shell process is 0.7, 2.0, and 3.2 $ times 10 to the 6th power for 100, 500, and 1000 tons of sulfur/sd capacity Claus units, respectively. The total operating costs for these units are, respectively, 610, 1930 and 3310 $/stream day. The capital investment corresponds to about 75% of the capital investment of the preceding Claus unit.

47687 **APTIC NO. 69495**

Hansen, J. P.

ROTARY COMPRESSORS AS IDEAL VAPOR RECOVERY MACHINES. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1972. (Presented at the American Society of Mechanical Engineers, Petroleum Division, Petroleum Mechanical Engineering and Pressure Vessels and Piping Conference, New Orleans, La., Sept. 17-21, 1972.)*

A brief description is given of the adaptation of rotary compressors of the sliding vane type to vapor recovery and the design and limits of the rotary unit in the vapor recovery area. Design changes made to adapt a compressor to this particular application are described. The effects of vapor recovery gas on the materials of construction and the gas effects on the ratings and the limits of the machine are shown. Lubrication and component equipment needed for proper application of recovery compressors in the vapor recovery area are discussed. Different types of vapor recovery systems and the applications of the rotary compressor in these areas are described. (Author abstract)

47688 **APTIC NO. 69798**

Jones, T. R.

ODOUR NUISANCES IN INDUSTRY. *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-11, Part 2, p. 57-70, 1972. (Presented at the National Society for Clean Air Annual Conference, 39th, Scarborough, England. Oct. 16-20, 1972.)*

Odors which are emitted by chemical plants are more likely to produce complaints than almost any other pollution. Most complaints derive from organic odors. These odors from chemical plants and other industries include phenolic, butyric, amine, acrylic, mercaptan, styrenic, musty, acrid, and fetid. The principles of odor control are reviewed including dispersion through tall chimneys, absorption and adsorption, oxidation by air (combustion), oxidation other than by air, other chemical reactions, and ultraviolet irradiation, condensation, and masking. Factors which determine the choice of odor control, odor control at a viscose rayon production factory, hydrogen sulfide removal, the Ferrox Process, scrubbing, removal and recovery of carbon disulfide, and a description of an adsorption plant are also discussed. A discussion of the paper is included.

47689 **APTIC NO. 69613**

Lapedes, D. E., M. G. Hinton, Toru Iura, and Joseph Meltzer

ASSESSMENT OF DOMESTIC AUTOMOTIVE INDUSTRY PRODUCTION LEAD TIME OF 1975/76 MODEL YEARS. VOLUME I - EXECUTIVE SUMMARY (FINAL REPORT). *Aerospace Corp., El Segundo, Calif., Office of Air and Waste Management Contract 68-01-0417, ATR-73(7321)-1, EPA-460/3-74-026-a, 51p., Dec. 1972.*

NTIS: PB-238902/AS

Automotive industry production lead time requirements to meet the 1975/76 emission standards are summarized, with particular emphasis on catalytic converter installation. The 1975 production schedules include provisions for the incorporation of emission control systems which include catalytic converters among several other devices. The catalytic converter is identified by all automobile manufacturers as the most critical production lead time item because it is schedule-controlling due to the lead time required by suppliers to develop facilities for mass producing both substrates and finished catalysts (approximately 2 yr). No domestic manufacturer to data has successfully completed mileage accumulation tests to 50,000 mi with catalytic converters. Current production lead time schedules of contending substrate and catalyst manufacturers require production order commitments from automobile manufacturers by November to December 1972 in order to ensure quantity production of oxidation catalysts in time for the 1975 model year. Mass production of oxidation catalysts of the automotive type has never been accomplished by any company; however, the catalyst firms believe that related production and quality control techniques (in the chemical and petrochemical industries) provide a firm basis for assurance that their proposed production lead time schedules can be met.

47690 **APTIC NO. 67140**

Lasky, Jack S. and Ronald W. Fuest

PROCESS FOR REMOVAL OF ACIDIC MATERIALS FROM FLUIDS. *(Dept. of Health, Education and Welfare, Washington, D. C.) U. S. Pat. 3,646,594. 6p., Feb. 29, 1972. 8 refs. (Appl. June 11, 1969, 29 claims).*

A process for removing acidic materials such as sulfur dioxide from a fluid such as water or waste gas is described. The removal is achieved by passing the fluid through a shaped article formed from a polyolefin, a polyester, or a nylon in an admixture with a nitrogen-containing polymer. Present-day air pollution control methods using synthetic high-polymeric materials result in advantages not heretofore obtained, and yet there are inherent difficulties associated with the use of such materials. For example, certain high-polymeric materials which have high chemical stability and softening temperatures are being used in liquid and air filter media and bag collectors. When these materials are saturated with pollutants, the non-regenerable material must be destroyed or discarded. In many cases, incineration of the material results in undesirable pollutants from the combustion gases. The new material is chemically stable to acidic reagents, has a relatively high melting temperature, can remove the pollutants from the air, and can be regenerated from continual successive uses, making it an improvement over previous materials. (Author abstract modified)

47691 **APTIC NO. 66755**

Monroe, E. S.

IMPROVEMENT OF EXISTING SYSTEMS. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 7, p. 312-337. 1 ref.*

Improvements in existing industrial air pollution control systems are discussed. Inert solid matter or fly ash can be separated from gas streams with conventional collection methods but the success of the particular collection method often depends on the temperature of the combustion gases. Water injection is the preferred cooling method, with air injection being the next preference. Smoke, one form of active solid matter, can be reduced or eliminated by increasing excess air flow to the furnace, providing a catalyst to shift the reaction rate, enlarging the furnace, changing fuels, and improving turbulence. Adequate combustion controls and maintenance are essential for continued smokeless operation. Gaseous hydrocarbons may be recovered either by condensation or activated carbon adsorption or may be flared, incinerated, or abated with sophisticated burner systems called fume abaters. Catalytic units are a good method of oxidizing various hydrocarbons if the process is carefully designed and controlled. Nitrogen oxides can be controlled with low excess air firing and/or low-temperature firing. Sulfur dioxide can be controlled by conversion to magnesium sulfate particulates, wet scrubbing, low sulfur fuel usage, and dry catalytic treatment, though the latter two methods are still experimental. Sulfur trioxide can be prevented from forming by either removing the sulfur from fuel or by using low excess air firing. Halogens can be removed by scrubbing, while phosgenes (carbonyl chlorides) and cyanides can be eliminated by careful burner design and good combustion control.

47692 **APTIC NO. 69981**

Nichols, Grady B. and John P. Gooch

AN ELECTROSTATIC PRECIPITATOR PERFORMANCE MODEL (FINAL REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract CPA 70-166, Program Element 1ABO12, Rept. EPA-650/2-74-132, ROAP 21ADJ-026, SORI-EAS-74-344, 186p., July 1972. 57 refs.*

NTIS: PB- 238923/AS

An electrostatic precipitator performance model was developed and critical factors limiting precipitator performance were analyzed. Quantitative relationshps were established between precipitator performance and these factors. Operating experience and costs were reviewed to determine the influence of gas temperature on overall system economics and problems related to the tendency toward corrosion and fouling of the air heater and precipitator. A small-scale precipitator was designed and constructed to study precipitator fundamentals such as the effect of changing time, relation of particle distribution in the interelectrode space to collection efficiency, and reentrainment factors. Measurements were made at several power stations burning different types of coal to compare resistivities measured by several types of apparatus and to provide data for analysis of precipitator performance.

47693 **APTIC NO. 66851**

Oliver, Earl D.

CONTROL OF EMISSIONS FROM RELATIVELY SMALL BOILERS AND FURNACES. *AIChE Symp. Ser., 68(126):168-174, 1972. 18 refs.*

Processes for the control of emissions from relatively small boilers are reviewed and the option of using low sulfur fuels is examined. Stack gas cleaning can be accomplished: by a caustic scrubbing process that aerates the waste at high pH; by separating the absorption step from the regeneration step, and using magnesium oxide (MgO) to contact the flue gas in a venturi scrubber to remove sulfur dioxide and fly ash; by a lime slurry in a two stage spray scrubber; and by scrubbing SO2 with sodium hydroxide solution. The choice between cleaning the stack gas and changing to low S fuels is strongly affected by the premium for the fuel. The premium is strongly influenced by the effect of supply and demand. The extent of desulfurization required affects the cost of the process. The capital costs of a scrubbing system is primarily related to the stack gas rate rather than the steam capacity or heat rate. The relations among these quantities vary with the efficiency of the furnace and the percentage of excess air. If nitrogen oxides must be controlled and modified combustion conditions are not sufficient, additional stack gas treating is required.

47694 **APTIC NO. 69328**

Princiotta, Frank T.

CONTROL OF SULFUR OXIDE POLLUTION FROM POWER PLANTS. *Preprint, American Public Power Assoc., 52p., March 14, 1972. (Presented at the American Public Power Association, Engineering and Operations Workship, Anaheim, Calif., March 14, 1972.)*

NTIS: PB 228706

The importance of sulfur oxide control is reviewed. About 55% of the SO2 emitted in the U. S. is from power plants; this percentage is expected to be 75% by the year 2000. The Clean Air Act has set standards of performance for new stationary sources which limits SO2 emissions from power plants. In order to meet primary ambient SO2 standards, it will be necessary to limit the emissions of existing power plants by no later than 1975. Due to the expected growth of the power industry, even relatively stringent SO2 emission controls will only control the exponential growth of SO2 over the next two decades; they will not drastically decrease emissions over present values. A nomograph is presented which estimates the sulfur content in fossil fuel required to meet various control standards. There does not appear to be sufficient low-sulfur Eastern steam coal to meet standards. Low-sulfur oil can be available for all oil-burning power plants at substantially higher costs through increased imports, production, blending, and desulfurization of high-sulfur oil. Stack gases can be cleaned of SO2 by wet lime/limestone scrubbing, wet magnesium oxide scrubbing, and catalytic oxidation. These processes and related research projects are discussed. Other SO2 control methods described include contact sulfuric acid process for converting SO2 to H2SO4 and dry limestone injection. The various control methods are compared.

47695 **APTIC NO. 69991**

Roessler, W. V., Toru Iura, and Joseph Meltzer

STATUS OF INDUSTRY PROGRESS TOWARDS ACHIEVEMENT OF THE 1975 FEDERAL EMISSION STANDARDS FOR LIGHT-DUTY VEHICLES (FINAL REPORT). *Environmental Protection Agency Contract 68-01-0417, Rept. EPA-460/3-74-027, ATR-73(7322)-1, 473p., July 1972. 203 refs.*

The technological progress of the automobile industry for meeting the 1975 Federal emission standards for light duty vehicles is evaluated. First choice systems incorporate an oxidizing catalytic converter with air injection to promote the oxidation of unburned hydrocarbons and carbon monoxide of the engine exhaust and use exhaust gas recirculation for control of nitrogen oxides. Carburetion system modification range from complete redesigns to improvements to current systems and are directed toward improving the precision and stability of the air/fuel ratio. Most vehicles will have spark ignition reciprocating engines, although rotary engine and diesel engine vehicles will be produced. The stratified charge, the gas turbine, the Rankine, and the Stirling engine are still in the development stage. No manufacturer has demonstrated meeting the 1975 standards for 50,000 miles.

47696 **APTIC NO. 66757**

Ross, R. D.

SELECTION OF EQUIPMENT FOR GASEOUS WASTE DISPOSAL. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 9, p. 422-470. 44 refs.*

The selection of equipment for gaseous waste disposal is reviewed in terms of the applicability of a control process for a given type of process stream, the materials and construction required, and the relative economics of various control systems. Topics covered include: dispersion of waste gases with stacks; gas-liquid absorption processes with or without chemical reactions; absorption equipment such as packed columns, plate columns, sparging systems, spray towers, and miscellaneous high energy scrubbers; gas-solid absorption systems, including the dry Dolomite injection process with wet scrubbing, catalytic oxidation, the alkalized alumina process, and the Reinluft process; chemical oxidation processes using such oxidants as potassium permanganate, chlorine, or chlorine dioxide; the use of condensation for vapor recovery via tubular surface condensers, tubular air cooled condensers, or direct contact condensers; odor counteraction methods such as masking and neutralization; activated carbon systems for gas adsorption; direct flame, thermal, and catalytic incineration; the use of catalysts for gas stream purification; and heat recovery methods.

47697 **APTIC NO. 69928**

Schopf, Paul S.

AN EXPERIMENTAL INVESTIGATION OF ACOUSTIC PRECIPITATION OF AEROSOLS AT MODERATE SOUND INTENSITY. *Brown Univ., Providence, R. I., Div. of Engineering, Bureau of Mines Contract HO111398, BM OFR. 48-73, 39p., Nov. 1972. 6 refs.*

NTIS: PB 222755

Results of an experimental investigation into the possible use of medium energy acoustic fields (130 to 140 dB) to precipitate 1 to 10 micron particles are presented. The aerosol was produced with a LeMer generator using oleic acid and nitrogen. The sound field was a sinusoidal standing wave field in an acrylic tube, with light transmission data used for concentration determination. The results showed collection efficiencies of up to 80% on 2 micron particles with a residence time of 11.8 sec at a sound pressure level of 139 dB re 0.00002 N/sq m. A discussion of the possible turbulent mechanism is given. (Author abstract)

47698 **APTIC NO. 66756**

Schumann, J. L.

SELECTION OF EQUIPMENT FOR PARTICULATE REMOVAL. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 8, p. 338-421. 36 refs.*

Considerations are presented for the selection of particulate removal equipment. The first step in equipment selection is identification of the gas-cleaning problem in terms that can be directly related to the performance characteristics of the following basic types of particulate removal equipment: mechanical collectors, fabric filters, wet scrubbers, and electric precipitators. Mechanical gravity settling chambers have very low collection efficiencies on fine and moderately fine dusts, while cyclone collectors represent a compromise among collection efficiency, draft loss, and size. Fabric filters have high efficiency at all loads from maximum down to zero gas flow but are large and require costly bag replacement. The major advantage of wet scrubbers is the great variety of types which allows the selection of a collector suitable for almost any collection problem including collection efficiencies as high as 99%. Disadvantages include the disposal of wet sludge, high energy costs for high efficiency scrubbers, and high material and maintenance costs associated with chemical corrosion and unavailability of scrubbing liquids of sufficient clarity. Electric precipitators offer high collection efficiency with a minimum of operating and maintenance costs. Disadvantages include high installation cost, unpredictable collection efficiency on certain high-resistivity dusts, and loss of collection efficiency at gas flows above the designed rating.

47699 **APTIC NO. 69381**

Singh, Laskar

SALIENT FEATURES OF SO2/OLEUM PLANT. *Chem. Eng. World, 7(10):132- 134, Oct. 1972.*

Sulfur dioxide and 23% oleum (105.18% sulfuric acid) are used in two important reactions to produce the intermediate required for the manufacture of Caprolactam. The features and processes of an SO2/oleum plant are discussed. A double absorption system is used to manufacture H2SO4. It emits 1/10 the sulfur dioxide and 1/6th the sulfur trioxide as a single absorption system. The double absorption system increases the overall plant efficiency to 97.8%-98% compared to 95.5% in conventional plants. It also makes the stack gases harmless and clear. During plant start-up, when normal working conditions cannot be maintained, an ammonia scrubber is used to remove the lower SO2 and SO3 concentrations.

47700 **APTIC NO. 69528**

Wolfrom, Walter, Walter Schultheis, and Wolfgang Koelling

PROCESS FOR THE ABSORPTION OF SIF4-CONTAINING OFF GASES IN WATER OR AQUEOUS HEXAFLUOSILICIC ACID. *(Verfahren zur Absorption von SiF4-haltigen Abgasen in Wasser oder waessriger Hexafluokieselsaeure). Text in German. (Assignee not given.) E. Ger. Pat. 88,078. 2p., Feb. 20, 1972. (Appl. Jan. 13, 1971, 2 claims).*

A method for the absorption of silicon tetrafluoride-containing waste gases in water or aqueous hexafluosilicic acid to obtain commercial hexafluosilicic acid of at least 20% concentration is described. The silicon tetrafluoride is absorbed in two successive, slotted-bottom absorbers with a maximum temperature of the absorbing suspension on the first absorption stage of 50 to 60 C, corresponding to a desired hexafluosilicic acid concentration of 20-30% to prevent incrustation of the absorber bottom. Cooling of the SiF4-containing waste gas is achieved by dilution with cold air.

47701 **APTIC NO. 69475**

Wrobel, J.

ADSORPTION OF SO2 BY CALCIUM COMPOUNDS IN FLUIDIZED BED. *(Adsorption de SO2 par les composes du calcium en couche fluidisee). Text in French. Chim. Ind. Genie Chim., 105(25): 1849-1851, Dec. 1972.*

Model experiments and experimental data concerning the removal of sulfur dioxide from flue gases by means of calcia and calcium in a fluidized bed are described. Calcia of a grain size range of 0.48-1.02 mm with a critical velocity of fluidization of 0.22 m/sec, and grains of calcium hydroxide 0.2-0.6 mm in diameter were used. Fine granulated calcium compounds were suitable for the removal of SO2 from flue gases at temperatures below 100 C and relative humidities around 80%. Fluidized-bed adsorbents permit higher gas flow rates at lower pressure losses than fixed bed adsorbers.

47702 **APTIC NO. 67137**

ALUMINUM FLUORIDE FROM WET PROCESS PHOSPHORIC ACID WASTES. *Brit. Chem. Eng. Proc. Tech., 17(7/8):609-610, July/Aug. 1972. 1 ref.*

The wet phosphoric acid process evolves large quantities of fluorine compounds; upwards of 40-45 fluosilic acid kg/ton phosphoric anhydride emitted is recoverable. The present capacity of the fertilizer industry is enough to supply virtually the entire aluminum industry with the fluorine compounds it requires, particularly aluminum fluoride. A process capable of producing AlF3 from H2SiF6 solution arising from the scrubbing of the waste gases evolved in the production of phosphoric acid is described. Variable costs for this process are cited. An approximate estimate of the investment for a plant to produce 100 tons/day of AlF3 is $752,000. An analysis is presented of investment distribution by different sections of the process and by function.

1971

47703 **APTIC NO. 67064**

Crentz, William L. and Albert W. Deurbrouck

COAL AND THE SULFUR PROBLEM. *Preprint, 18p., 1971. (Presented at the World Energy Conference, 8th, Bucharest, Romania, June 28- July 2, 1971, Paper 2.3-28.)*

The use of coal by electric utilities, coal resources in the U. S., and processes for reducing sulfur in coal are reviewed. Several sulfur control methods are discussed in detail, including washing of coal and removal of sulfur oxides from combustion gases by throw-away processes (dry and wet limestone), by catalytic and regenerative processes (catalytic oxidation, alkaline scrubbing, and the Stone and Webster Ionics System), and by other processes. A combined coal washing and gas cleaning operation may be necessary to obtain the 1% sulfur content in coal necessary for utility fuel. Of the mines examined east of the Mississippi River, only 35% contained less than 1% organic sulfur coal. Using present coal washing technology, perhaps 20% of the mines will be able to produce an acceptable product; the remaining coal will only be usable if gas cleaning or combined washing/gas cleaning processes are developed. (Author conclusions modified)

47704 **APTIC NO. 67139**

Meyers, Robert A., John S. Land, Christopher C. Shih, and Jerry L. Lewis

CELLULOSICS FOR THE REMOVAL OF SULFUR DIOXIDE FROM FLUE GAS STREAMS. *(TRW Inc., Redondo Beach, Calif.) U. S. Pat. 3,629,996. 5p., Dec. 28, 1971. 4 refs. (Appl. Feb. 19, 1970, 7 claims).*

Sulfur dioxide contained in flue gases from a coal-burning, thermal generating plant can be sorbed on finely divided cellulose such as a shredded paper at temperatures in the range of 215-300 F. After the cellulose has been saturated with the SO2, it is desorbed by flue gas at about 350-450 F. The desorbed SO2 may be then conveniently forwarded to a plant for processing to sulfuric acid. Spent cellulose may be forwarded to the plant for burning or it may be further digested to carbohydrates. Previously, cellulose was not utilized commercially for SO2 sorption, since lengthly desorption times were required and it was not known that SO2 could be desorbed at all from the cellulose. Therefore, this process proves that within a preferred temperature range, the desorption of SO2 from the cellulose occurs quickly. This not only permits efficient utilization of the cellulose, but also enables cycling of the cellulose from desorption to sorption and vice versa. A large cellulose inventory is thus not required, and rapid cycling permits conservation of the heat contained in the cellulose. (Author abstract modified)

1970

47705 **APTIC NO. 69518**

Collina, A., M. Cucchetto, F. Traina, A. Cappelli, and M. Dente

KINETICS OF SULFUR DIOXIDE OXIDATION WITH MONTECATINI EDISON CATALYST AND MATHEMATICAL MODEL OF AN INDUSTRIAL REACTOR. *Preprint, American Inst. of Chemical Engineers, New York, 15p., 1970. 3 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 63rd, Chicago, Ill., Nov. 29-Dec. 3, 1970, Paper 3c.)*

A mathematical model is described for the simulation of the behavior of industrial reactors for sulfur dioxide oxidation. The model is based on the kinetic equation determined for Montecatini Edison catalyst and takes into account the resistances due to phenomena of interphase and intraphase mass and heat transfer, playing a by no means negligible part in the reaction considered. The mathematical model was checked using experimental data of industrial reactors; the results of the calculations were in good agreement with the experimental data. An optimization of the operating conditions of an industrial reactor was made, using the mathematical model described. The values of the first and second layer inlet temperatures of the air injection flow rates after the second and the third layers, corresponding to the maximum value of SO2 conversion, were determined. The calculated values of the operating variables are very close to the values adopted on the industrial reactors. Further development of the model concerns simulation of reactors operating at a pressure greater than 1 atm and industrial reactors design optimization. (Author conclusions)

47706 **APTIC NO. 75023**

Delyagin, G. N., V. I. Kirsanov, and A. G. Omishchenko

SPECIFIC FEATURES OF THE COMBUSTION OF ANTHRACITE COAL DUST IN THE FORM OF WATER-COAL SUSPENSIONS IN THE FIREBOX OF A STEAM BOILER. *(Osobemosti szhiganiya antracitovogo shtyba v vide vodougol nykh suspenziy y topke parovogo kotla). (Source not given.) 1970 (?). 3 refs. Translated from Russian, 11p.*

A study of thye combustion of water-coal suspensions of gas (light) and dry-burning (lean) Don basin coal in a vertical cylindrical precombustion chamber is described. Appropriate thermal conditions must be created at the base of the flame to obtain stability and high burning-out of the fuel in a short combustion zone. The presence of intensive recirculated combustion product flows ensured the ignition of the suspensions with higher initial working humidity. The burning out of an anthracite coal dust water-coal suspension in the firebox of an industrial steam boiler during nonoptimal regimes was 97%. Water-coal suspensions obtained from the flotation cleaning of coal can be used as fuels in this manner.

47707 **APTIC NO. 65363**

Eannarino, Joseph Michael, Michael Samuel Graniere, Jr., Anthony John Comis, and Frederick E. Stynler

AFTERBURNER FOR ENGINE EXHAUST GASES. *(Nachverbrennungsvorrichtung fuer die Auspuffgase von Brennkraftmaschinen). Text in German. (Tri-Sciences Industries Inc., Utica, N. Y.) W. Ger. Pat. Appl. 1,476,618. 4p., March 19, 1970. 4 refs. (2 claims).*

The housing has two combustion chambers arranged in series and separated by an intermediatry cone-shaped guide wall. Each chamber has an ignition unit. An annular gap exists between the extremity of the guide wall and the housing s inner wall. The gas inlet chamber connected to the inlet pipe is funnel shaped and has a similar shaped funnel located at a short distance downstream from the parallel to it. The intermediate chamber between these two funnels is connected to the annular chamber encircling the combustion chambers. The fresh air source coupled to the outlet region of the housing comprises a blower and metering unit. The afterburner is designed for operation over large ranges of engine speed and loading.

47708 **APTIC NO. 64575**

Fitt, John Stanley and Frederick Rowe

PURIFYING HYDROGEN AND HYDROCARBON GASES. *(Verfahren zur Herstellung von Cyclohexan durch katalytische Hydrierung von Benzol mit Hilfe von urspruenglich durch Kohlenmonoxyd und Benzol verunreinigtem Wasserstoff). Text in German. (Imperial Chemical Industries Ltd., London (England)) W. Ger. Pat. Appl. 2,008,624. 2p., Sept. 3, 1970. (3 claims).*

Cyclohexane is prepared by catalytic hydrogenation of benzene with hydrogen containing carbon monoxide and benzene as impurities, the hydrogen being purified before use by contact with liquid cyclohexane to extract the benzene (the resulting mixture being hydrogenated to cyclohexane) and by passage over a methanization catalyst to convert the CO to methane. The preferred hydrogenation catalyst is nickel on an alumina support. The impure H2 may be obtained in the dealkylation of toluene.

1969

47709 **APTIC NO. 69516**

Horn, Alexander

PROTECTIVE MEASURES TO BE TAKEN DURING PROCESSING ASBESTOS- CONTAINING MATERIALS IN SHIPYARDS. *(Schutzmassnahmen beim Bearbeiten von asbesthaltigen Werkstoffen beim Schiffbau). Text in German. Arbeitsschutz, no. 4:81-84, 1969. 6 refs.*

Precautions to be taken during processing, such as cutting, drilling, or machining, of asbestos cement and asbestos-based boards in shipbuilding are presented. Since there is no therapy for asbestosis available, and since bronchial and other carcinomata can be regarded as possible complications of asbestosis, very strict precautions are to be taken. Effective local suction of asbestos particles released during cutting, drilling, and machining operations is required to abate the asbestos concentration in the air to not higher than 30 particles/cu cm for particles not longer than 10 micron, or 2 mg/cu m. The combination of suction with fine dust filter masks to be worn by the workers is an absolute requirement. Subjects with chronic respiratory troubles and persons under 18 years of age should not be permitted to perform such jobs.

47710 **APTIC NO. 70186**

Trummer, Alfred

REMOVAL OF FLYASH FROM INCINERATOR EXHAUST - LARGE PARTICLES REMOVED IN COOLER-CYCLONE AND REMAINDER IN SPRAY SUMP. *(Anlage zum Entfernen von Flugasche und sonstigen Verunreinigungen aus Rauchgasen). Text in German. (Trummer and Co., Frutigen (Switzerland)) W. Ger. Pat. Appl. 1,905,608. 3p., Sept. 18, 1969. 1 ref. (3 claims).*

Hot exhaust gas at 800 C from a waste incinerator containing fine and coarse dust particles is first cooled in a cyclone to 250 C by passing over air cooled tubes. Coarse dust falls to the base and from there into a sump tank. The fine dust laden air is then taken to the bottom of a water spray chamber. The water reduces the temperature below dew point and scrubs out most of the dust. The remaining, by now damp, dust particles are settled out in a second chamber. The gas is then extracted by a fan and blown up a stack where it mixes with the air which was used to cool the incoming gas stream and the mixture is then at a temperature above the dew point which protects the stack.

47711 **APTIC NO. 69929**

Wojciechowski, J., Z. Gortel, E. Grzywa, and J. Kopytko

A METHOD OF CATALYTIC REMOVAL OF ORGANIC IMPURITIES AND CARBON MONOXIDE FROM GASES. *(Sposob katalitycznego usuwania zanieczyszczen organicznych i tlenku wegla z gazow). (Inst. of Heavy Organic Synthesis) Polish Pat. 57512. 2p., June 30, 1969. (Appl. April 6, 1967, 2 claims). Translated from Polish. Scientific Translation Service, Santa Barbara, Calif., NASA-TT-F-15,648, 7p., June 1974.*

NTIS: N74-25652

A method for the removal of organic impurities and carbon monoxide from industrial flue gases and internal combustion engine exhaust gases by catalytic combustion is described. Known methods of removing organic impurities and CO rely most frequently on the oxidation on platinum-group metal catalysts which are expensive, highly susceptible to poisoning, and inefficient. The relatively high temperature of processes involving oxidation of catalysts of other metallic oxides such as nickel, cobalt, chromium, and copper and the low activity of those catalytic systems in comparison with the platinum-group metals are reasons for their limited application in industrial practice. In this invention, oxidation takes place on a catalyst prepared by saturation of the carrier with a solution of copper and zinc nitrates. The catalyst can be used at a broad range of temperatures and for a variety of substances. Sulfur compounds are relatively harmless to the catalyst. The copper-zinc catalysts are also comparatively low in cost.

1968

47712 **APTIC NO. 75014**

Isayev, V. V.

INVESTIGATION OF COMBUSTION OF COAL CLEANING WASTES, IN THE FORM OF WATER-COAL SUSPENSIONS ABOVE A LAYER OF FUEL. *(Issledovaniye protsessa szhiganiya otkhodov ugleobogashcheniya v vide vodougol nykh suspenziy nad sloyem topliva). (Source not given.) 1968 (?). 6 refs. Translated from Russian, 12p.*

The cleaning of coal by wet flotation produces highly wetted flotation sludges and tailings. While the sludges are partially used as a power fuel, the flotation tailings are discarded. Utilization of flotation tailings would permit an increase in fuel resources, free unproductively occupied areas, protect the air basin from pollution, and decrease the operating expenses of storage and transportation. A method of using the flotation tailings in the form of dispersed fuel systems (water-coal suspensions) in the fireboxes of steam boilers is described. The temperature level can be increased to stabilize the process. High-ash coal cleaning wastes, in the form of a suspension, using a layer of burning solid fuel as a stabilizer, ensuring steady ignition and combustion of the suspension, was burned in a boiler as a test. The burning fuel bed was a good stabilizer. The optimum excess air ratio in combustion above a fuel bed was determined at a boiler rating of approximately 20 tons/hr, suspension fraction 0.5, and ash content 17%. With increase in the excess air ratio, the heat losses with the flue gases increased, and the incompleteness of combustion decreased. In burning the suspension above a bed, the optimum value of the excess air ratio beyond the boiler was 1.70-1.75; it was 1.3-1.4 times less than in bed combustion of run-of-the-mine coal. The boiler unit efficiency with this excess air ratio and load of 20 tons/hr reached 71%. The optimum excess air ratio in flame combustion of the suspension was within 1.05-1.1. An increase in ash content of the suspension increased the total corrected moisture content of the fuel from 7.0 to 11.4. The flue gas temperature depended on the corrected fuel moisture content. An increase in ash content of the water-coal suspension somewhat decreased the combustible content of the material entrained.

1967

47713 **APTIC NO. 75020**

Delyagin, G. N., V. M. Ivanov, V. V. Isayev, and B. S. Filippov

PROSPECTS FOR THE USE OF WATERY COAL-PREPARATION WASTE WITH A HIGH ASH CONTENT IN POWER PLANTS. *(Perspektivy ispolzovania vysokozolnykh obvodnennykh otkodov ugleobogasheniya v energeticheskikh ustanovkakh). Inst. of Mineral Fuels (USSR), 1967 (?). 5 refs. Translated from Russian, 23p.*

Coal cleaning by flotation produces watery wastes containing small coal particles, mineral inclusions, and water. The wastes represent about 3% of the entire separated coal. A method of using these wastes containing a high ash content as a power plant fuel, rather than disposing of them through mud-settling pits, is described. Semi-industrial and laboratory scale combustion tests were conducted on solid fuels with a high ash content (up to 70% by dry weight). Experiments were also carried out on the fuel- spray combustion of dry coal-preparation wastes. The results of these experiments are reviewed. The use of wastes with a 60% ash content in the Central Chertinsk preparation plant in the amount of 29,000-30,000 tons/yr is described. The method for the use of coal preparation wastes makes it possible to recycle the wastes into the process in the preparation plant and to eliminate storage disposals for them. It also eliminates the laborious processes connected with the extraction and transportation of these wastes.

47714 **APTIC NO. 67136**

English, M.

FLUORINE RECOVERY FROM PHOSPHATIC FERTILIZER MANUFACTURE. *Chem. Process Eng., vol. 48:43-47, Dec. 1967. 12 refs.*

The present demand for fluorine is expanding so rapidly that the traditional sources -- natural cryolite and fluorspar -- may soon be exhausted. An alternative source is fluorapatite, containing 3.5% fluorine, used principally for the production of superphosphate and phosphoric acid for fertilizers by the wet process. A process is described for using the by-product from the process, fluorosilicic acid, which is generally discarded, in the commercial production of fluorosilicates, cryolites, and fluorides. The fluorosilicic acid is produced during production of superphosphate and phosphoric acid when fluorine compounds in the stack gas are absorbed in a countercurrent scrubber. (Author abstract modified)

1965

47715 **APTIC NO. 75018**

Shitin, V. A.

PROBLEM OF PREPARING A COAL-WATER SUSPENSION BY WET GRINDING OF CRUSHED COAL. *(K voprosu o prigotovlenii vodougol noy suspenzii putem mokrogo pomola droblenoga uglya). All-Union Scientific Research, Planning, and Design Inst. of Hydraulic Coal Mining (USSR), p. 96-102, 1965 (?). 3 refs. Translated from Russian, 14p.*

A method for the wet grinding of coal to prepare a finely dispersed coal-water suspension suitable for combustion in chambered fireboxes in electric generatinng plants is described. The moisture content of the slurry strongly affects the mill performance. An increase in the moisture of the coal subjected to grinding from 10 to 40% is attended by a proportional rise in the intensity of material grinding. Watering above 52% again increases the yield of coarse coal classes. The optimal grindability is attained when the moisture of the charged coal is 47-52%. A moisture content of 50% must be regarded as optimal for the coal charged. The effect of the weight of ball charge on coal grindability was also noted. The volume of the ball charge was varied within the limits of 21-63% of the mill volume. A ball charge ensuring 40-42% filling of the mill was optimal. The effect of ball size and composition of thhe ball charge on grindability was also studied. Pilot plant studies were also conducted on the wet grinding of coal. This method can be applied to flotation cleaning of coals to produce a water-coal suspension for use as a fuel.

1957

47716 **APTIC NO. 67759**

Sel kin, G. S. and N. I. Zadalya

CONTROLLING BROWN SMOKE FORMED DURING THE OXYGEN BLOWING OF CONVERTERS. *(Bor ba s obrazovaniyem plavil noy pyli pri produvke vanny kislorodom). Text in Russian. Stal, 17(10):884-887, 1957. 2 refs.*

A method for controlling the brown smoke emission (composed of ferric oxide, alumina, magnesia, calcia, and silica) generated during the oxygen blowing of converters or open-hearth furnaces, is described. It was possible to effectively reduce the rate of brown smoke formation by humidifying the oxygen with water added at a rate of 0.5-0.9 of the weight of the oxygen. Blowing with humidified oxygen does not deteriorate the quality of the steel since it apparently serves only as a cooling agent. Humidified oxygen can also be used in the early stages of melting, e.g., one hour after the melting of the pig iron in the furnace.

1951

47717 **APTIC NO. 69418**

Kane, John M.

WHAT TO DO ABOUT AIR POLLUTION. FOUNDRY DUST CONTROL PROBLEMS. *Am. Foundryman, 1951:34-38, Feb. 1951. 2 refs. (Presented at the Michigan Regional Foundry Conference, East Lansing, Mich., Nov. 10-11, 1950.)*

Pollution control in the foundry industry is reviewed. For dust-producing operations such as shakeout, sand conditioning, abrasive blasting, tumbling, swing frame, snag, and portable grinding, present day collection equipment in general foundry use can keep escaping concentrations to less than 0.1 grain/cu ft. Processes in this group equipped with air cleaning equipment of the proper type and in good repair, should cause no problems in air pollution control work. Cupolas and electric melting furnaces for melting ferrous metals can be equipped with collection equipment that can reduce solids escapement to the order of 4-8 lbs/hr/ton of metal melted. Escaping metal fumes in such quantities will still present a visible discharge appearance. Extension of fly ash and smoke abatement codes developed for coal burning gases of combustion to industrial processes will be complicated because: no regulation will be effective that does not have sound engineering and reasonable cost and maintenance; standards of required air cleanliness measured in weight/unit of gas volume will be meaningless for those applications where extensive dilution by added room or outside air to the exhausted contaminant is practical; visual methods of determining solids in stack gas are futile except as a crude gauge to indicate discharge conditions that might be in violation of a standard based on a permissible weight basis; stack sampling procedures are expensive and time consuming.

1949

47718 **APTIC NO. 69517**

Kirkpatrick, W. S.

THE ECONOMIC UTILIZATION OF WASTE GASES BY THE INTEGRATION OF BASE METAL AND CHEMICAL FERTILIZER OPERATIONS AT TRAIL, B.C. *Inst. of Mining and Metallurgy London (England), Proc. Empire Min. Metall. Congr., 4th, London, England, 1949, p. 962-977, 1950. (July, Paper HI.9.)*

The closely-integrated metallurgical and chemical operations of the Consolidated Mining and Smelting Co. of Canada, Ltd. are described. The company is primarily a producer of lead and zinc. It was faced with an air pollution problem caused by the large quantities of sulfur dioxide in the metallurgical waste gases. To overcome this problem, the recovery and economic disposal of SO2 was accomplished by the construction of a large- scale chemical fertilizer plant. The by-product integration occurring as a result of this unusual combination of a large metallurgical operation with an equally large chemical operation is discussed. The contact process was used to manufacture sulfuric acid from the SO2; the sulfuric acid was then used in the fertilizer production. By-product oxygen produced at the at the ammonia operations is used in SO2 recovery and other processes. By-product heat as steam is also used in the fertilizer production and the metallurgical operations. Other by-products such as sulfuric acid from zinc plant electrolyte, hydrofluosilicic acid, nitrogen, distilled water, and gypsum are also reused. (Author summary modified)

MEASUREMENT METHODS

1975

47719 **APTIC NO. 70075**

Baumgardner, Ralph E., Thomas A. Clark, and Robert K. Stevens

COMPARISON OF INSTRUMENTAL METHODS TO MEASURE NITROGEN DIOXIDE. *Environ. Sci. Technol., 9(1):67-69, Jan. 1975. 8 refs.*

A comparison study was performed between the newly developed chemiluminescent nitric oxide-nitrogen dioxide monitor and existing automated NO2 monitors based on coulometry and colorimetry and the 24-hour manual reference method for the measurement of NO2. Correlations were obtained among the various techniques by sampling ambient air in a nonurban atmosphere. In addition, a detailed study of maintenance requirements, calibration stability, and typical response patterns of the instrumental methods was conducted. The chemiluminescent monitors successfully measured ambient concentrations of NO2 under conditions of this study. The coulometric monitor gave lower mean values, and the Federal reference method gave higher mean values than the other measurement methods at the nonurban site. Performance tests showed that the chemiluminescent monitors have a faster response time than the coulometric or colorimetric methods and that each method had the sensitivity to measure NO2 concentrations of 0.01 ppm. Analysis of the calibration data for each instrumental method showed little variation. (Author abstract)

47720 **APTIC NO. 70235**

Koglin, Bernd, Kurt Leschonski, and Wulf Alex

PARTICLE SIZE ANALYSIS. 7. SURFACE MEASUREMENT. *(Teilchengroessenanalyse. 7. Oberlfaechenmessung). Text in German. Chem.-Ing.-Tech., 47(1):21-24, 1975. 28 refs.*

The tutorial discussion of the particle size analysis is continued with a discussion of surface measurements. The fundamentals and a survey of the principles of the sorption methods for the purpose of surface measurements are given. If sorption experiments are carried out on porous systems, adsorption on the surface might be overlapped by capillary condensation in the pores described by the Kelvin equation. Three sizes of pores are distinguished: the micropores, which are too small for application of the Kelvin equation; the mesopores, which are typical for capillary condensation; and macropores, which are too big for the measurement of capillary condensation. Three methods are outlined which can be used for determination of the pore volume and the pore size distribution in the three classes of pore sizes.

1974

47721 **APTIC NO. 69181**

Akiyama, Shigeyuki and Tsugukage Oshima

ACCURACY AND MAINTENANCE OF THE SULFUR DIOXIDE ANALYZER BY THE NDIR METHOD. *(NDIR-ho ni yoru SO2 bunseki-kei no seido iji to mentenamsu ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso, (J. Instrum. Contol Assoc., Japan), 23(4):155-158, April 1974. 5 refs.*

The nondispersive infrared method (NDIR) is capable of determining carbon dioxide, carbon monoxide, nitric oxide, and hyrocarbons, which are present in waste gases discharged from stacks. This method is especially suited for the determination of sulfur dioxide concentration in the atmosphere. Typical specifications are: the range of measurement, 0-2000 ppm; output for a recorder 0 - 16 mA, 0 - 1 V, 0 - 100 mV; sensitivity, 0.5% of the reproducible full scale; drift, within

2%/week of the full scale; response speed, 1 min after the entrance of a gas for 90% response; amount of sample, 1-2 l/min; ambient temperature -5 to -40 C; power consumption, 500 VA; and weight, about 60 kg. The main components are the probe, primary filter, sample inlet, drain separator, mist catcher, cooler, secondary filter, sample pump, needle valve, flow meter, analyzer, console, indicator, and drain pump. Besides daily maintenance, the following periodical maintenance is necessary: replacement of the primary filter, cleaning of the secondary filter, replacement of the mist-catcher every 3-6 mo, the replacement of the diaphragm in the drain pump, and zero checking and span checking (once a week).

47722 **APTIC NO. 70111**

Allen, J. D.

AN ABSOLUTE GALVANIC DETECTOR FOR NITROGEN DIOXIDE. *Analyst, 99(1184):765-770, Nov. 1974. 15 refs.*

The performance of a modified Hersch and Deuringer galvanic detector for nitrogen dioxide was examined. The response was coulometric at low flow rates and low concentrations on the basis of 1 Faraday (96 487 C) per mole of nitrogen dioxide. This response is explained in terms of the electrochemical reduction of nitrogen dioxide to the nitrite ion or nitrous acid vapor, which might be present in humid air. The detector has an immediate application for calibrating low-concentration mixtures containing NO2, but further work is necessary to investigate the reliability of the selective scrubbers required for monitoring NO2 in polluted, ambient air. (Author abstract)

47723 **APTIC NO. 70112**

Allen, J. D., J. Billingsley, and J. T. Shaw

EVALUATION OF THE MEASUREMENT OF OXIDES OF NITROGEN IN COMBUSTION PRODUCTS BY THE CHEMILUMINESCENCE METHOD. *J. Inst. Fuel, 1974: 275-280, Dec. 1974. 18 refs.*

The suitability of chemiluminescence monitors for the measurement of nitric oxide and nitrogen dioxide in combustion exhaust gases was studied. These instruments are the best currently available in terms of ease of operation, stability, precision, sensitivity, concentration range, linearity, and speed of response. The design features which are necessary to reduce interference effects to negligible proportions are described. Gravimetrically prepared NO/nitrogen gas mixtures for calibration are reliable to within + or - 2%. Suitable procedures for sampling combustion exhaust gases containing oxides of nitrogen are described. (Author abstract modified)

47724 **APTIC NO. 69262**

Ando, Tadao

CONTINUOUS ODOR INTENSITY INDEX MEASURING DEVICE (ON THE CYCLO- OLFACTOR). *(Renzoku shukido sokutei sochi (Saikuro-orufakuta ni tsuite). Text in Japanese. Preprint, Japan Environmental Hygiene Center, Fukui, p. 84-85, 1974. (Presented at the Japan Environmental Hygiene Center Conference on Environmental Health, 18th, Fukui, Japan, Oct. 3-4, 1974, Paper 6.)*

A more consistent method of measuring odor intensity is outlined in this article. The instrument, which can be used indoors or outdoors, is constructed of the following parts: a sampling device; continuous dilution device for the test odor; emission mask for the test odor; a digital indicator of the dilution rate of the test odor; fresh air pump for use in dilution; fresh air flushing mechanism to avoid odor-sensing fatigue while taking measurements; hot air flushing mechanism to clean the tubes of residual odors before and after the measurements. The test odors can be diluted continuously from 1-1000 times, at will. The test tube receives a specified test amount for each trial.

47725 **APTIC NO. 69762**

Aoki, Koichi, Kunihiko Asakuno, and Toshio Ohiro

DYNAMIC RESPONSE OF AN AUTOMATIC SALTZMAN NOX ANALYZER. *(Renzoku sokuteiki no doteki oto --zarutsuman NOx kei ni tsuite--). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):182, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 34.)*

The Saltzman nitrogen oxides analyzer will improve mathematically a continuous monitoring system for oxidant levels. To aid in calculation, it is assumed that the reading by a potassium iodine oxidant analyzer is fully nitrogen dioxide when NO2 levels are high, and it is also assumed that there is no delay in response time. Field data by the KI analyzer was compared with mathematically corrected oxidant levels by the Saltzman analyzer, and the suspected response delay in the Saltzman analyzer did not occur.

47726 **APTIC NO. 65201**

Barton, S. C. and H. G. McAdie

A CUMULATIVE SURVEY TECHNIQUE FOR ATMOSPHERIC NITROGEN DIOXIDE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974. Paper 74-41.)*

A passive monitoring technique for nitrogen dioxide is described. Nitrogen dioxide is absorbed on a triethanolamine-impregnated filter paper mounted in an inverted 47 mm petri dish. The NO2 content of the filter is extracted with Griess-Saltzman solution and determined colorimetrically. The method responds linearly to NO2 dosages equivalent to 1-month exposures at typical ambient concentrations. Investigations of the effect of humidity, wind velocity, temperature, absorber composition, exposure profile, and other pollutants on the response of the method indicated that wind velocity variations will exert the most pronounced effect under normal atmospheric conditions. The NO2 plates have been exposed at a suburban and down-town air sampling stations in Metropolitan Toronto and the response compared with continuous instrumental measurements and with other recently developed NO2 plates. The response of the two types of plates correlated well, with the plate developed in this program being approximately 40% more sensitive. The cumulative response of the plates was proportional to the total NO2 dosages calculated from the continuous measurements. Two potential interferences were noted: the response of both types of plates was significantly reduced when mounted in brackets in which the plate bottom was exposed to sunlight, and the buildup of excessive moisture on the plates during heavy rain resulted in erratic results. The laboratory and field investigations confirmed that the NO2 plates provide a simple and inexpensive method for the semi-quantitative determination of average NO2 levels over one week to one month periods. (Author abstract)

47727 **APTIC NO. 69871**

Becker, W. J. and W. Breuer

THE STAGE OF DEVELOPMENT AND CALIBRATION OF MEASURING INSTRUMENTS FOR GASEOUS AIR POLLUTANTS. *(Zum Entwicklungsstand und zur Kalibrierung von Messeinrichtungen fuer gasfoermige Luftverunreinigungen). Text in German. PTB-Mitt., 84(2):93-104, 1974. 24 refs.*

Conventional methods for the automatic analysis of gaseous air pollutants are generally adequate to determine gas concentrations down to the ppm range. They are, however, usually not sensitive enough to cope with trace gas concentrations in the ppb range. An electrochemical method of trace gas detection was developed. It is based on the use of fuel cells with gelled organic electrolytes; electrodes must be chosen which are capable of reacting with the gas that is to be determined.

Thus, silver electrodes are used to measure hydrogen sulfide concentrations. In addition to the selectivity and sensitivity, this method has another advantage: the reaction of the gas with the electrode ions generates an electrical signal directly (optical, thermal, magnetic etc.): the conversion into electrical signals constitutes an additional source of errors. For the calibration of continuous gas analyzers, a special instrument was designed; it utilizes motor-driven, rotating stop-cocks.

47728 **APTIC NO. 70237**

Belyayev, S. P. and L. M. Levin

CORRECTION OF AEROSOL SAMPLING ERRORS. *(Korrektirovaniye oshibok otbora prob aerozoley). Text in Russian. Izv. Akad. Nauk SSSR Fiz. Atmosfery i Okeana), 10(5):512-518, May 1974. 16 refs.*

The problems and possibilities of the correction of aerosol aspiration sampling errors are discussed and practical recommendations are given. Formulas permitting the correction of concentration and particle size distribution errors inherent in the available sampling methods are presented. Errors due to the pulsations of the free flow rate in isokinetic sampling do not exceed +5% of the amplitude of the pulsations which do not exceed 50% of the gas flow rate. The distortions due to great variations in wind speed during sampling can be corrected by using different formulas for low and high wind speeds, and applying an upper and lower critical aspiration rate.

47729 **APTIC NO. 69690**

Blosser, R. O., A. G. Kutyna, R. A. Schmall, M. E. Franklin, and K. Jain

THE STATUS OF SOURCE EMISSION MONITORING AND MEASUREMENTS. *TAPPI, 57(9):74-76, Sept. 1974. 2 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Annual Meeting, Miami Beach, Fla., Jan. 14-16, 1974.)*

The current extent of use of continuous source particulate and gaseous emission monitors in the pulp and paper industry and the findings of several field studies in which the performance of monitoring devices was observed and of several field and laboratory investigations of the analytical sensitivity of some source gas sampling systems are reviewed. The results of an extensive field study in which particulate measurement methods were compared at four sources are also summarized. An inventory of source emission monitoring devices showed not only an increasing number of mills continuously monitoring particulate and gaseous emissions, but also use of an increasing number of new generation, higher sensitivity particulate monitoring devices. Examination of reduced sulfur losses in existing gas sample, collection, conditioning, and transfer systems showed that minimum losses of 0.5-1 ppm total reduced sulfur occurred. Use of monitoring information should consider this fact. Two continuous particulate monitoring systems, the light transmission and sodium ion methods were capable of detecting changes in particulate concentration on kraft furnaces at or below the level permitted in existing regulations. They can be used in detecting substandard performance of control equipment at an early stage. Laboratory and field studies defined the problems associated with using selected particulate sampling methods. The problems are principally ones of inability to maintain some gaseous components of emissions in a gas phase as they move through particulate sampling equipment. All or portions of some gases can be measured as particulate matter in some sampling methods. A particulate sampling method which measures an amount of material equivalent to that caught in the front half of the Environmental Protection Agnecy sampling train exists at the kraft recovery furnace, smelt tank, lime kiln, and combination fuel-fired boilers. (Author summary modified)

47730 **APTIC NO. 69472**

Blurton, K. F. and H. W. Bay

CONTROLLED-POTENTIAL ELECTROCHEMICAL ANALYSIS OF CARBON MONOXIDE. *Am. Lab., 1974:5p., July 1974. 8 refs.*

An electrochemical technique for the measurement of carbon monoxide is described along with three monitoring instruments based on the principle. The operating principle of the technique is the electrochemical oxidation of carbon monoxide at a potential-controlled electrode. The potential of this sensing electrode is maintained constant at a value where the current due to oxygen reduction and to oxygen evolution is negligible, and the current generated by the electrochemical reaction is then directly proportional to the carbon monoxide concentration. The basic components of the system are an electrochemical sensor, a sampling system (pump), a sample preconditioning unit (water bottle, filter), an electronic control circuit (potentiostat, amplifying circuit), and a measuring circuit. The electrochemical principle differs from other electrochemical methods by the use of a three-electrode electrochemical sensor and by the use of a potentiostat to maintain constant the potential of a Teflon-bonded gas diffusion sensing electrode. Three instruments based on this design which cover the complete range of CO monitoring requirements are a self-contained spot checker for restricted environments, a continuous area monitoring device, and a personnel monitor for living and working environments. Since the sensor signal is linear with respect to the CO concentration, the instruments can be assigned for any single or dual CO range. Common ranges are 0-100 ppm/0-500 ppm. Fast response and recovery along with short lag time allow for rapid changes in CO concentration to occur. Interferences from other gases are eliminated by the scrubbing effect of the filter and the particular electrode potential selected.

47731 **APTIC NO. 69179**

Boninsegni, Christian, Arnold Deuber, and Hans-Urs Wanner

ODOR ANALYSES AT TRASH COMPOSTING. *(Geruchsanalysen bei der Kehrichtkompostierung). Text in German. Umwelthygiene, 25(8): 172-175, 1974. 6 refs.*

A new method is described for adsorption of odorous substance from composting of solid waste on activated coal by the Dano Process. Gas mask filters were filled with 200 cc granulated activated coal Norit RG 1,25. A pump transported an air flow of 16.3/cu m/hr/ at an underpressure of 138 mm. Desorption was accomplished with the aid of heat and vacuum. The filters were exposed for 18 hr and desorption lasted three hr. The collected samples were analyzed with a gas chromatograph Perkin-Elmer Elmer model 900 with packed 2 m glass columns. Best results were achieved with a packing of dimethyl-hexyl sebacinate plus sebacic acid on kieselguhr, with 25% packing of the column. For determination of the concentration parallel measurements were taken with the air quality chromatograph model 6800 by Beckmann. A total hydrocarbon concentration betweeen 0 and 6 ppm (referred to methane) was measured. The values for carbon monoxide were between 0.5 and 1.8 ppm. A total of 35 substances could be identified (all listed in a table) of which not all were intensely odorous. Composting by the Dano process releases following odorous substances: propionic acid, butyric acid, valerianic acid, amyl alcohol, acetoine, diacetyl, crotonaldehyde, valeraldehyde, butyraldehyde, acetone, pyridine, methylmercaptan, butylmercaptan, and ethylsulfide, as well as ammonia and hydrogen sulfide.

47732 **APTIC NO. 69395**

Boubel, Richard W., Bahram Sadri, and Jack W. Hirsch

PARTICULATE SAMPLING HAS GONE AUTOMATIC. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Annual Meeting, Boise, Idaho, Nov. 17-19, 1974, 74-AP-13.)*

Sampling of particulate matter from air pollution sources must be conducted isokinetically to obtain valid samples. A new and unique sampler was developed which automatically adjusts the sample flow to isokinetic conditions at the nozzle. All previous samplers have required the person taking the sample to continually monitor, and manually adjust the system to maintain isokinetic conditions. This manual adjustment introduced errors because of adjustment lag and inaccuracies in the manual settings. The automatic sampler is completely electronically controlled to eliminate human error. The critical parameters of the source are sensed, and the electronic system calculates and adjusts the flow as necessary for exact isokinetic conditions. The time lag is essentially zero and accuracy is maintained at + or - 1%. In addition, the electronics continuously calculate and totalize the gas flow through the sampler. This results in a readout of the total sample volume which is as accurate as that determined by a standard gas meter in the system. (Author abstract)

47733 **APTIC NO. 70182**

Bricard, Jean, Patrick Delattre, Gerard Lebaupain, and Guy Madelaine

COUNTING OF CONDENSATION NUCLEI AT REDUCED PRESSURE. *(Comptage des noyaux de condensation a pression reduite). Text in French. C. R. Hebd. Seances Acad. Sci., Ser. B., 278(6):191-193, Feb. 1974. 5 refs.*

A device and method for condensation nuclei counting in a continuous flow process at reduced pressure to a lower limit of 60 mm of a mercury column are described. The gas with the condensation nuclei is previously saturated with n-butyl alcohol vapor, applying supersaturation to bring about the condensation of the vapor on the condensation nuclei, after which, the droplets thus formed traverse a laser beam. The light diffused by the individual particle in the path of the laser beam is collected by a photomultiplier, and the generated pulses are counted in a counter circuit. The counting efficiency decreases with decreasing pressure to reach 0% at 100 mm of mercury column, which is due to the reduced rate of droplet formation. This deficiency was eliminated by increasing the supersaturation to at least 470% by heating the supersaturator.

47734 **APTIC NO. 70258**

Chatfield, E. J. and H. Pullan

MEASURING ASBESTOS IN THE ENVIRONMENT. *Can. Res. Develop., 1974:23-27, Nov.-Dec. 1974. 28 refs.*

A technique for trace asbestos measurement (water or air matrices) is described, with particular emphasis on sample preparation for subsequent electron microscopic analysis. For air samples, a volume of about 5 cu m is filtered using a membrane filter with a pore size from 0.4-0.8 micron. The filter is transferred to a clean glass vial which is then placed in a plasma micro-incinerator for oxidation of organic materials and the filter itself at less than 80 C and 1 torr pressure under excitation by radio-frequency discharge. The residue is removed and double distilled water added. The ashed residues are gently dispersed ultrasonically, and an aliquot of the dispersion is centrifuged on to a 1 cm diameter cover glass at 8000 gravity units for 20 min. A drop of very dilute detergent is also added to the centrifuge tube. The disc is removed, dried, and applied with a thin carbon coating by vacuum evaporation. The carbon film is then scored with a scalpel and floated onto water, with pieces of the carbon being picked up on a 200 mesh electron microscope support grid. About 10 grid squares are searched for asbestos particles using a transmission electron microscope at 25,000 magnification

47735 **APTIC NO. 65223**

Cleveland, William S., Beat Kleiner, and Jack L. Warner

USING ROBUST STATISTICAL METHODS IN ANALYZING AIR POLLUTION DATA WITH APPLICATIONS TO NEW YORK-NEW JERSEY PHOTOCHEMISTRY *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1974. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-76.)*

The importance of robust statistical methods in determining the typical behavior of the data in the field of air pollution is demonstrated by an analysis of data relevant to an understanding of the nature of atmospheric photochemistry in the New York City- New Jersey metropolitan area. Three types of analyses are presented. First, for sunny days from May 1 to September 30, 1973, three robust average, diurnal curves, corresponding to three intervals of daily maximum ozone in Bayonne, are presented for each of the following variables: Bayonne wind, O3, nitrogen dioxide, and aldehydes; and Elizabeth nitric oxide, total hydrocarbons, and carbon monoxide. Second, one of many possible tests for the quality of ambient air pollution data is to calculate site-to-site robust correlations. Nitrogen dioxide data from Newark, Bayonne, and Elizabeth pass this test. Third, the difference in O3 behavior on workdays and Sundays is presented. At the Welfare Island site, from May 1 to September 30, 1973, the quantiles of Sunday means and maxima are generally higher than the corresponding workday quantiles. (Author abstract modified)

47736 **APTIC NO. 70185**

Cohen, Ariel and Michael Graber

STRATOSPHERIC AEROSOL LIDAR MEASUREMENTS OVER JERUSALEM. *Preprint, International Assoc. Meteorology and Atmospheric Physics (Ontario) and IAPSO 23p., 1974. 19 refs. (Presented at the IAMAP/IAPSO Combined 1st Special Assemblies, Melbourne, Australia, Jan. 1974.)*

Lidar measurements were used to map the aerosol layer centered at 20 km over Jerusalem. Scattering measurements were made in two polarizations, and changes in the number density as a function of time were detected without using air density profile assumptions. Analysis of the depolarization of back-scattered light was used to evaluate size distribution variations. A pulsed ruby laser, operating at a wavelength of 594.34 nm, was Q-switched by a mirror rotating at 400 revolutions/sec and produced typical energies and pulse lengths of 7 joules and 4 microseconds, respectively. The receiver system was designed so that its response to the normal and parallel components of the back-scattered light was equal. The maximum in aerosol number density appeared to be around 21 km, and a weak minimum was obtained at about the tropopause (11 km). Time variations were observed in the vertical distribution of aerosol from one night to another as well as within a given night.

47737 **APTIC NO. 69497**

Cooper, John C., Harvey E. Birdseye, and Russell J. Donnelly

A NON-METHANE HYDROCARBON MONITOR USING CRYOGENIC SEPARATION. *Preprint, National Science Foundation, Washington, D. C., Research Applied to National Needs, 5p., 1974. 3 refs. (Presented at the Trace Contaminants Conference, Annual, 2nd, Asilomar, Calif., Aug. 29-31, 1974.)*

Methane has a higher vapor pressure than any other hydrocarbon. Because of this, methane can be separate from the other hydrocarbons in ambient air by condensing the heavier ones on a suitably cold surface. A methane separator based on this idea was constructed and tested with bottled gas mixtures. The device trapped more than 95% of all the nonmethane hydrocarbons used and had no measurable effect on methane. A complete monitoring instrument is being constructed using this concept. Its design is discussed. The device is based on a cryogenic separation technique coupled with a flame ionization detector. (Author abstract modified)

47738 **APTIC NO. 65194**

Cuddeback, John E., Bernard E. Saltzman, and William R. Burg

SOLID ABSORBENT METHOD FOR SAMPLING AND ANALYSIS OF NITROGEN DIOXIDE IN AMBIENT AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-25.)*

A sampling and analysis system to measure nitrogen dioxide in the ambient air is described. Copper shot is an effective absorbent for collecting samples at ambient levels. The analytical system is based on the desorption of the sample from the copper by heating in a hydrogen carrier stream. The desorbed sample is then determined by a combination of catalytic pyrolysis, which converts it to ammonia, and a Coulson Conductivity Detector. Data are presented showing overall recovery, effects of storage of collected samples, results for 24-hour sampling and interferences. Studies indicate the feasibility of the method for short-time sampling and for 24-hour sampling. The detection limit is as little as 100 ng nitrogen dioxide in laboratory studies. This solid absorbent method provides a simple, convenient, and compact means for air sampling. (Author abstract modified)

47739 **APTIC NO. 69429**

DeMore, William B.

CALIBRATION REPORT. LAAPCD METHOD MORE ACCURATE: ARB MORE PRECISE. *Calif. Air Resour. Board Bull., 5(11):1-2, Dec. 1974.*

A committee was appointed by the Air Resources Board to investigate methods of ozone measurement after a discrepancy in readings by Air Resource Board (ARB) and Los Angeles Air Pollution Control District (LAAPCD) calibration methods was discovered. The committee studied previous literature reports on the study and tested the ozone readings as determined by the respective agency procedures with an absolute ozone measurement made by an ultraviolet photometric technique. An alternative candidate procedure for absolute ozone determination, an Environmental Protection Agency procedure called gas phase titration, was also used in the comparisons. Both the EPA and ARB procedures, which employ neutral buffered potassium iodide solutions, gave ozone readings which were high compared to either the photometric or the gas phase titration values. Using the photometric values, considered to be the more reliable, the ARB results were consistently high by 25 to 95%. The LAAPCD measurements were somewhat low, although they approached 95% of the standard value at high ozone levels. Two alternative calibration procedures were selected for future use: continued use of the standard ARB procedure with a correction factor to bring the results in line with absolute ozone levels; and a commercially available ozone monitor, such as the Dasibi instrument, which is calibrated by comparison with the absolute ozone photometer.

47740 **APTIC NO. 69654**

Dencker, W., M. Robinson, and R. Villalobos

DEVELOPMENT OF AN ACETYLENE MONITOR AT THE PART PER BILLION LEVEL. *Beckman Instruments, Inc., Anaheim, Calif., Environmental Protection Agnecy Contract 68-02-0778, Program Element 1A1003, Rept. EPA-650/2-74-056, ROAP 56AAI, 31p., Aug. 1974.*

NTIS: PB-238474/AS

Instrumentation for the collection and analysis of atmospheric acetylene at the ppb level was developed. Acetylene comes primarily from vehicular exhausts and can be used as a tracer of pollution from urban to rural areas. An automated concentration technique was used whereby one liter of air was collected in a tube filled with molecular sieve. The trapped contents were then automatically flushed into a gas chromatograph for separation and assay of acetylene. This collection and analysis system was designed to automatically perform three acetylene analyses/hr at acetylene concentrations ranging from .03 to 250 ppm. A portable collection device was also developed for the collection of acetylene in locations far removed from the analyzer. The collection devices used in the portable sampler were identical to the collection device on the gas chromatograph. (Author abstract modified)

47741 **APTIC NO. 70191**

Devienne, F.-Marcel and Jean-Claude Roustan

NEW METHOD FOR IDENTIFICATION AND MEASUREMENT OF THE CONCENTRATIONS OF GAS POLLUTANTS IN AIR. *(Nouvelle methode pour l identification et la mesure des concentrations des gaz polluants de l air). Text in French. C. R. Hebd. Seances Acad. Sci., Ser. B, 278(10):433-435, March 1974.*

A new method for the identification and measurement of the concentrations of gaseous pollutants, such as carbon monoxide, carbon dioxide, and sulfur dioxide, is described. The air sample to be analyzed is ionized by means of an ion source, after which most of the ions formed are dissociated in an argon- or helium-filled collision chamber at negative or positive potential. The pollutant is identified from the mass ratio of the newly formed ions relative to the original gas molecule by means of an electron multiplier and an electrostatic analyzer. Carbon dioxide yields oxygen and carbon atoms in the collision chamber. Sulfur dioxide is identified from the mass ratio of the sulfur atom and O2 ion, while the other ions generated, namely SO+, and O+, are unsuitable for identification. The gaseous pollutant concentration in mixtures with known composition is determined on the basis of the proportionality between the peak intensity and the gas concentration up to an upper limit of about 10%.

47742 **APTIC NO. 69487**

Dieck, Ronald H.

GAS TURBINE EMISSION MEASUREMENT UNCERTAINTY. *Preprint, Instrument Society of America, Pittsburgh, Pa., 9p., 1974. 14 refs. (Presented at the International Instrumentation- Automation Conference and Exhibit, New York, Oct. 28-31, 1974, Paper 74-639.)*

Assessing gas turbine emission levels requires a knowledge of the measurement accuracy, particularly when emission measurements are utilized to demonstrate compliance with the Environmental Protection Agency s regulations. Without a knowledge of measurement uncertainty, the reasons for compliance or noncompliance may remain unclear. The assessment of emission measurement uncertainty requires properly combining the uncertainties in both emission measurement and related gas turbine performance parameters to obtain a total uncertainty. Emission measurement uncertainty results from calibration gas analysis uncertainty, instrument percision, sample error, and the effects of ambient factors such as temperature and humidity. The related gas turbine parameters whose uncertainties must be considered include thrust and fuel-air ratio. The effect of total uncertainty on the uncertainty in the calculated emission level in lbs/1000 lb-thrust-hr may then be evaluated through the use of Taylor s Series error propagation. The sources of emission measurement uncertainty are reviewed, and the effect of the total uncertainty on the ability to demonstrate compliance with regulations is evaluated. Practically achievable accuracies are contrasted with those quoted in the regulations. Promising experimental and/or analytical methods for reducing the uncertainty in emission measurements are described. (Author abstract)

47743 **APTIC NO. 69268**

Dieterich, Peter D.

SAMPLING AND FLOW MEASURING DEVICE. *(Assignee not given.) U. S. Pat. 3,803,921. 4p., April 16, 1974. 3 refs. (Appl. March 5, 1971, 6 claims).*

A sampling and flow measuring device which can be used where very low fluid flow velocities are encountered is described. The device consists of an upstream probe having several spaced lateral openings formed along its length and a blind end contacting the wall of the pipe opposite to the side into which the probe is engaged, a downstream probe engaged within the pipe and having an opening therein for delivering by-passed fluid back into the pipe, a conduit exterior of the pioe leading to the respective probes and providing a bypass path whereby a sample of the fluid from the pipe will enter the upstream probe and pass through the bypass path for return to the pipe by way of the opening in the downstream probe, and a flow sensor connected in the bypass path which responds the rate of flow of the sample in the bypass path. Thus, in stacks or pipes carrying gases, the invention can be utilized by returning the sample drawn in at the upstream probe and passing it in relation to a transducer responding to very low flow rates and thereafter returning the sample to the downstream probe.

47744 **APTIC NO. 65187**

Feigley, Charles E.

SOME STATISTICAL ASPECTS OF AIR MONITORING INSTRUMENT CALIBRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1974. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-14.)*

A conceptual, statistical basis for determining and improving the quality of instrumental pollutant measurements is presented. The statistically interpretable confidence interval is used as a measure of data quality. A conceptual framework is presented within which calibration systems may be analyzed. A calibration technique can be viewed as a series of data domain conversions. Such a representation allows the technique to be scrutinized for all possible sources of error. Linear lease squares regression is often employed in instrument calibration to find the best straight line relationship between instrument output and sample concentration. The assumptions made in order to specify confidence limits on estimates from the regression line are stated, and the consequences of invalid assumptions are discussed. Then calibration of a chemiluminescent ozone instrument using neutral buffered potassium iodide as a reference method is examined. Sources of and minimization of errors are discussed. Typical calibration data are analyzed for various segments of the procedure. Confidence intervals for bias in the measurements of O3 concentrations are calculated for the system. When calibration is based on a single measurement, in the best case the 95% confidence interval is 8 + or - 1.4 pphm and in the worst case is 8 + or - 4.4 pphm. If calibration is based on six replicate measurements, the intervals are reduced to 8 + or - 0.73 pphm and 8 + or - 1.8 pphm, respectively. The major sources of errors are the standardization and dilution of iodide solutions and the collection of O3 in neutral buffered KI solution. Errors from the first source may be minimized by weight regression using several different solutions; errors from the second source may be reduced by replication of neutral buffered potassium iodide measurements. (Author abstract modified)

47745 **APTIC NO. 70232**

Fernandes, E. and P. Suter

SAMPLING PROBES FOR GAS/PARTICLE SUSPENSIONS WITHOUT DISTURBING THE ONCOMING FLOW. *(Absaugsonden fuer Gas/Partikel Suspensionen ohne Stoerung der Zustroemung). Text in German. Brennstoff- Waerme-Kraft, 26(12):502-506, Dec. 1974. 6 refs.*

Very thin-walled sampling probes for gas/particle suspensions supply representative samples at isokenetic sampling. Thick-walled probes generally disturb the oncoming flow and supply samples, which are no longer representative with the degree of deviation depending on the particle diameter. By analog-digital computing, a disturbance-free thick-walled probe shape was found which at isokinetic sampling produces straight stream lines. Its sampling quality was experimentally verified. Even at inclined oncoming flow, the probe is better than conventional probes.

47746 **APTIC NO. 65514**

Fox, Donald L., Joe Sickles, Mike Kuhlman, Parker C. Reist, William Wilson, and Donald L. Fox

DESIGN AND OPERATING PARAMETERS FOR A LARGE AMBIENT AEROSOL CHAMBER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-152.)*

The design considerations, construction details and operating parameters of a large (8000 cu ft) outside reaction aerosol chamber constructed in rural North Carolina are described. The chamber is triangular in cross-section, 20 ft wide, 20 ft high, and 40 ft long, and is covered with clear 5 mil Teflon film. The outdoor location of the chamber permits the reaction volume to be exposed to the natural conditions of temperature and solar radiation. A recirculating air system allows the air in the chamber to be passed through an absolute fiberglass filter for adjustment of condensation nuclei concentration and also through driers and humidifiers for humidity adjustment. Internal fans are provided for mixing of the chamber contents without use of the recirculating system so that various degrees of turbulence can be approximated. A sampling line from the chamber passes directly to an instrument room, located directly under the chamber where direct analyses for particle composition, concentration, size, and gas composition and concentration are carried out. The instrument is capable of measuring in the ppb range ammonia, carbon monoxide, formaldehyde, nitric acid, nitric oxide, nitrogen dioxide, ozone, peroxyacetyl nitrate, sulfur dioxide, and propylene. Parameters which can be varied in this system include number, size, distribution, and chemical composition of pre-existing nuclei, as well as humidity, solar radiation, temperature, and trace gas concentration and composition. (Author abstract modified)

47747 **APTIC NO. 69345**

Glenn, Russell D.

DEVELOPMENT OF A LASL WHOLE-AIR SAMPLER FOR WB-57F AIRCRAFT. *California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Atomic Energy Commission Contract W-7405-ENG 36, 9p., Jan. 1974. 1 ref.*

NTIS: LA-5491-MS

A whole-air sampler was developed for collecting samples of stratospheric air at ambient pressures for laboratory analysis. The principle of operation is to evacuate the same containers, fly them to sampling altitude, open the remotely operated vacuum valves, and take in ambient air through a suitable air delivery system until the internal sample pressure equilibrates with ambient. This system was designed for use aboard the WB-57F aircraft. The first test series was flown and certain mechanical problems were uncovered. Conclusions and recommendations for system improvement and future investigations are presented. The system can be used for on-line monitoring of stratospheric trace elements. (Author abstract modified)

47748 **APTIC NO. 69583**

Glover, D. W. and J. M. Hales

DEVELOPMENT OF AN IDEAL SAMPLER FOR BELOW-CLOUD SCAVENGING STUDIES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 136-137, April 1974.*

NTIS: BNWL-1850 PT3

The design of a sampler for below-cloud scavenging studies which shows promise for allowing zero dry deposition or suspension is described. The device consists of a 2-gallon picnic jug with an 8-inch poly funnel inserted into a 1-liter poly bottle. Holes in the funnel permit gas to escape but no water to penetrate. Liquid nitrogen in the bottom freezes the sample, and out- gassing forms a protective barrier in the funnel. No actual field tests have been performed with the sampler. The majority of field measurements of below-cloud washout with existing samplers are significantly contaminated by dry deposition and, in the case of gases, by resuspension.

47749 **APTIC NO. 69371**

Gordon, G. E.

INSTRUMENTAL ACTIVATION ANALYSIS OF ATMOSPHERIC POLLUTANTS AND POLLUTION SOURCE MATERIALS. *Recent Adv. Anal. Chem. Pollut. Symp. Proc., 4th Annu., Basel, Switzerland, 1974, p. 138-143. 8 refs. (June 17.)*

The use of instrumental activation analysis of atmospheric particulates for developing fingerprints to identify air pollution sources is discussed along with some preliminary laboratory findings. Concentrations of 24 elements (sodium, calcium, barium, aluminum, scandium, vanadium, manganese, iron, cobalt, nickel, copper, zinc, selenium, antimony, chlorine, bromine, lanthanum, cerium, samarium, europium, ytterbium, lutetium, hafnium, and thorium) in aerosols collected on Millipore filters were measured by neutron irradiation of the filters and observation of their gamma rays with germanium lithium detectors. Concentrations of the same elements in pollution source materials (automobile exhaust, industrial emissions, and the like) can similarly be measured, with fingerprints being developed for each air pollution source. The fingerprints can be used to identify major air pollution contributors, follow the movement and mixing of polluted air masses, and observe chemical reactions of pollutants.

47750 **APTIC NO. 69999**

Goulding, F. S. and J. M. Jaklevic

DEVELOPMENT OF AIR PARTICULATE MONITORING SYSTEMS (FINAL REPORT). *California Univ., Berkeley, Lawrence Berkeley Lab., Environmental Protection Agency Interagency Agreement EPA-IAG-D4-0377, ROAP 56AAI, Program Element 1A1103, Rept. EPA-650/4-74-030, 67p., July 1974. 8 refs.*

Results of the first year of a 2-year research program in the fabrication of a high-speed aerosol system are described. Twelve automated dichotomous sampling stations which collect particles in the 0 to 2 to 20 micron diameter ranges will be built. A prototype virtual impactor for aerodynamically separating particles into two size ranges is described, and design improvements for minimizing losses are discussed. Design parameters were determined for a high-speed energy dispersive X-ray fluorescence spectrometer capable of analyzing elements with atomic numbers above 13 during the first year of the research program. A prototype beta gauge for total mass determination was tested, and a detection limit of 10 micrograms/sq cm was measured. For the purpose of sample identification, a system is described by which the X-ray spectrometer and beta gauge will be able to identify a digital code on each filter. (Author abstract modified)

47751 **APTIC NO. 68403**

Hadeishi, T., D. A. Church, R. D. McLaughlin, B. D. Zak, and N. Nakamura

TOTAL MERCURY MONITOR FOR AMBIENT AIR: THE IZAA SPECTROMETER. *Preprint, National Science Foundation, Washington, D. C., RANN, 16p., 1974. 6 refs. (Presented at the Trace Contaminants Conference, Oak Ridge, Tenn., 2nd Annual, 1974.)*

An isotope-shift Zeeman-effect atomic absorption (IZAA) spectrometer, originally developed for the direct measurement of trace elements in solid and liquid samples, was tested. It now has sufficient sensitivity for continuous monitoring of the total mercury concentration in ambient air. Improvements in technique increase its sensitivity by more than a factor of 100; this allows the detection of a minimum mercury concentration of 0.2 micrograms/cu m, 1/5 thy proposed Federal standard for ambient air for mercury. (Author abstract)

47752 **APTIC NO. 69590**

Hales, J. M. and T. W. Horst

A FLUX METER FOR DIRECT FIELD MEASUREMENT OF DEPOSITION AND RESUSPENSION RATES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 176-178, April 1974.*

NTIS: BNWL-1850 PT3

The conceptual design of a flux meter for direct field measurement of dry-deposition and resuspension rates is presented. The design of the meter is based on the assumption that at the measurement sites the deposition flux occurs primarily by eddy diffusion. Thus the flux is characterized totally in terms of a time smoothed cross term which is the vertical component of pollutant movement taken from an overall continuity equation. The time-smoothed product term is measured intact by means of drawing air samples into two reservoirs (one for updrafts and one for downdrafts) at rates exactly proportional to the vertical velocities experienced in the vicinity of the inlets. Rates of air withdrawal are controlled by two fast-response, proportional control valves that are actuated by a signal from an anemometer. Appropriate linearization circuitry is provided to compensate for nonlinearities in valve response. Filters are placed at the sample inlets when aerosol deposition rates are to be measured rather than gaseous pollutant flux.

47753 **APTIC NO. 69423**

Hall, Homer J.

PROBLEMS IN INSTRUMENTATION FOR S-ODORANT EMISSIONS. *Instrument Society of America, Pittsburgh, Pa., Instr. Soc. Am. Anal. Instr. Symp. Proc. 20th Annu. Pittsburgh, Pa., 1974, 12p. (May 12-15.)*

Commercially available instruments were evaluated for field measurement of sulfur-containing odorants in stack emissions from Kraft paper mills and petroleum refinery Claus plants. Coulometric, gas chromatographic, and tape sensor type measuring devices were evaluated for the measurement of hydrogen sulfide, methyl mercaptan, carbonyl sulfide, sulfur dioxide, carbon disulfide, and sulfur trioxide. Coulometric titrators were unable to handle interference from COS/CS2 or were of limited range. Tape samplers were poisoned by SO2 or subject to internal losses in unheated lines, while gas chromatographic instruments were too complex for field use. Carbonyl sulfide, an odorless compound which is commonly formed in reducing atmospheres where sulfur compounds are oxidized, was undetected or mistaken for odorous H2S in most analyses. Satisfactory operation for a 6-month period was not achieved for any of the instruments during lab and field evaluations. The large proportion of interferent to odorant compounds in stack gases is responsible for many of the analytical difficulties encountered in measuring odorous compounds.

47754 **APTIC NO. 69625**

Hamil, Henry F. and Richard E. Thomas

COLLABORATIVE STUDY OF METHOD FOR STACK GAS ANALYSIS AND DETERMINATION OF MOISTURE FRACTION WITH USE OF METHOD 5. *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0626, ROAP*

26AAG, Program Element 1HA327, Rept. EPA-650/4-74-026, 44p., June 1974. 7 refs.

NTIS: PB 236929/AS

Statistical analyses were performed on data from the Environmental Protection Agency Method 3 (Stack Gas Analysis for Carbon Dioxide, Excess Air, and Dry Molecular Weight) and from the stack gas moisture fraction determination obtained in the collaborative testing of EPA Method 5 (Particulates). Using data from Method 5 tests at a Portland cement plant, a coal-fired power plant, and a municipal incinerator, estimation was made of the precision that can be expected with the use of these methods. All collaborators used Orsat apparatus to perform their stack gas analyses, with the average of three consecutive analyses being taken. The within-laboratory standard deviation for CO2 was estimated as 1.44% by volume with 149 degrees of freedom. The laboratory bias standard deviation was 1.06%. Between-laboratory standard deviations of 1.78% CO2 were demonstrated and could cause the reported particulate concentrations of two laboratories obtaining the same uncorrected particulate concentrations to differ from each other by 36% at low CO2 levels and 16% at high CO2 levels. The within-laboratory standard deviation for dry molecular weight determination was 0.20 lb/lb-mole with 149 degrees of freedom, and the between- laboratory standard deviation was estimated at 0.24 lb/lb-mole. Excess air determination was a function of the O2 level, increasing exponentially as the percentage of O2 increases. Normal deviation in percentage of O2 can be expected to produce a variation of from 30-60% in excess air values. The within-laboratory standard deviation of the moisture fraction was estimated at 0.032 with 140 degrees of freedom; the between-laboratory standard deviation was 0.045.

47755 **APTIC NO. 70086**

Heyder, J., J. Gebhart, and W. Stahlhofen

DIAMETERS OF AIRBORNE PARTICLES. *Water, Air, Soil Pollut., vol. 3:567-572, 1974. 2 refs.*

Optical and centrifugal spectrometry for determining the particle size of aerosols is discussed. The response of an optical spectrometer is proportional to the (partial) light scattering cross-section of the particles so that the calibration curve is best represented by the light scattering-cross-section as a unction of the diameter of the spheres. In a centrifugal spectrometer, the penetration distance of the spheres is characteristic for their diameter so that the calibration curve of a centrifuge is given by the penetration distance as a function of the diameter of the spheres. The response of the spectrometers to spherical particles, and the effects of shape factors on spectrometer response are discussed.

47756 **APTIC NO. 69323**

Heyman, Glen A.

IMPROVED INTERFACE SYSTEM FOR EXTRACTIVE STACK MONITORS. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Anal. Instr. Symp., Annu., 20th, Pittsburgh, Pa., 1974, p. 19-23. (May 12-15.)*

A new sample interface system is described, designed for extractive type stack monitoring analyzers and incorporating a reflux probe and a permeation distillation dryer. Among its advantages are long filter life and selective water vapor removal. Analyzers for the gaseous pollutants sulfur dioxide, nitric oxide/nitrogen oxides, and carbon monoxide in addition to other analyzers for remaining components of interest (such as oxygen) in combustion processes can be mated with the improved interface system to provide a low maintenance monitoring system. Although designed for gas, oil, or coal fired combustion processes in power plants, chemical plants, or refineries, the system concepts can be used in sulfuric acid plants, nitric acid plants, iron and steel making, or any other process where particulates, aerosols, or water vapor are to be removed prior to analysis. The improved interface module is another step toward achieving the ultimate goal - the universal interface system. The module is applicable to most extractive analyzers for long-term reliable continuous monitoring as well as being portable enough for spot or short-term checks of problem areas in industrial plants. (Author abstract modified)

47757 **APTIC NO. 65186**

Higuchi, John E., Andrew Hsu, and Robert D. MacPhee

A STRAIGHTFORWARD DYNAMIC CALIBRATION PROCEDURE FOR USE WITH NOX INSTRUMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-13.)*

Colorimetric nitrogen oxide analyzers based on the Saltzman principle are usually statically calibrated by introducing known concentrations of sodium nitrite into the solution. The reaction expects a mole of nitrogen dioxide to produce the same amount of azo dye as 0.5 mole fo sodium nitrite. However values of 0.5-1.0 are reported depending on reagent composition, contact column efficiencies, and other variables. Therefore, a special calibration must be provided for each separate analyzer. A dynamic calibration procedure for use with ambient NOx analyzers, where nitrogen dioxide is directly introduced in admixture with air, was therefore devised. A primary standard of NO2-in-nitrogen (0.5-0.7% nominal NO2) is calibrated gravimetrically by passing a measured quantity of the gases through Ascarite. The concentration can be cross-checked by the phenoldisulfonic acid method with good results. Secondary standards are prepared for use in the field in 34-liter stainless steel tanks by dilution of the primary standard with prepurified air. The concentration of the secondary standard is then determined by comparing its response with that of the accurately diluted primary standard in the laboratory on a Saltzman-type NOx analyzer which is used solely for this purpose. Both the nitrogen dioxide and the nitric oxide sides of field analyzers are calibrated with NO2. Using the more convenient secondary NO2 standards, dynamic calibrations of 12 field instruments were performed following static calibrations with NaNO2. Saltzman factor values ranged from 0.73-0.92 with a mean value of 0.82 in the first round of dynamic calibrations. Values ranged from 0.69-0.88 with a mean of 0.80 in the second round. The Saltzman factor was not a constant of 0.72, but varied with each instrument. Dynamic calibration can be used for any NO2 system. It does not resolve the question of NO to NO2 conversion. The calibration curve is log-linear only up to about 100 to 150 pphm depending on the individual analyzer. Therefore, a special scale must be constructed in each case. (Author abstract modified)

47758 **APTIC NO. 67073**

Hinners, Thomas A., Willie J. Terrill, and Anthony V. Colucci

CONCENTRATION-DEPENDENT IONIZATION LOSS IN ATOMIC ABSORPTION SPECTROSCOPY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Bioenvironmental Lab. Branch, 9p., 1974 (?). 4 refs.*

Alkali metals and alkaline earth metals tend to ionize in atomic absorption flames, resulting in a reduction in the measurable nonionized atomic species. Other alkali metals are typically added in high concentration to suppress this loss. The risk of adding impurities with the suppressing ion prompted a study of a method of standard additions. Measurements were made for potassium when sodium or other alkali metal was not added as a suppressant. The measurable proportion decreased with decreasing concentration over the common analytical concentration range for potassium. The behavior was consistent with increasing ionization of potassium in the flame as the concentration of potassium in the solutions aspirated decreases. This trend appears to be analogous to the increased disassociation of some molecules (such as acetic acid) with decreasing concentration. Application of the method of standard additions to the potassium solutions investigated did not allow valid analysis by the linear extrapolation technique. The addition of sodium (1000 micrograms/ml) to the potassium solutions eliminated this nonlinear atomic absorption behavior. Thus, the practice of adding a suppressing metal is preferable to the use of the method of standard additions in the analysis of ionizing metals by atomic absorption or flame emission spectroscopy. (Author abstract modified)

47759 **APTIC NO. 65835**

Homolya, James B.

COUPLING CONTINUOUS GAS MONITORS TO EMISSION SOURCES. *Chem. Technol., 1974:426-433. July 1974. 7 refs.*

Several approaches to continuously monitoring a gaseous source emission stream are reviewed. The extractive approaches involve sample conditioning dependent upon not only the nature of the emission source, but also the detection technique being employed. The conditioning techniques include filtered probes, heated sample lines, water vapor removal systems, or a variety of dilution devices coupled to ambient air monitors. Dilution systems might offer the advantage that both ambient air and source monitoring could be accomplished by the same instrument. A recent investigation demonstrated the viability of in situ monitoring for sulfur dioxide which, in effect, eliminates all sample conditioning. These monitoring techniques and instrumentation are described in detail. (Author summary modified)

47760 **APTIC NO. 69269**

Homolya, James B. and Robert J. Griffin

SAMPLE DILUTION DEVICE-DISC DILUTER. *(Environmental Protection Agency, Washington, D. C.) U. S. Pat. 3,803,920. 6p., April 16, 1974. 4 refs. (Appl. Nov. 15, 1972, 9 claims).*

A combination fluid sampler and sampler dilution device adapted to be placed into a body of fluid to be sampled and subsequently analyzed is described. The apparatus consists of a means for entrapping and enclosing a sample of the fluid, a means adapted to conduct a continuous flow of sample diluent from a source of diluent to the sampler and thence to a sample analyzer, and a means adapted to bring the entrapped sample into mixing contact with the flowing diluent, whereby the sample is diluted and propelled by the continuously flowing diluent stream to the sample analyzer. The disc diluter of the invention eliminates the problem of moisture condensation and particulate entrainment by diluting the stack gas sample immediately within the stack environment. Since the moisture and particulate content of the sample are reduced by at least a factor of 1000, heated sample lines, refrigerated dryers, and particulate filters are eliminated.

47761 **APTIC NO. 69877**

Hoshika, Yasuyuki, Ichiro Kozima, Kazumi Koike, and Kenji Yoshimoto

THE GAS CHROMATOGRAPHIC ANALYSIS OF THE TRACE CONCENTRATIONS OF SULFUR COMPOUNDS IN THE URBAN AIR. *(Gasukuromatogurafi ni yoru toshi taikichu biryo io kagobutsu no bunseki). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 23(11):1393-1398, 1974. 27 refs.*

The gas chromatographic analysis of trace concentrations of sulfur compounds at the ppb or ppt level in urban air was studied. Samples were prepared by the direct cold trap method cooled with liquid oxygen and were then examined with a flame photometric detector. Hydrogen sulfide, carbonyl sulfide, sulfur dioxide, and carbon disulfide were identified with the use of TCP and TCEP columns in urban air samples. The detected concentration ranges and average values of the four sulfur compounds from April 5 to April 30, 1974 were: 0.5-24 ppb (average 2.4 ppb) for H2S, 0.4-2.9 ppb (average 1.2 ppb) for COS, 2.0-80 ppb (average 22 ppb) for SO2, and 0.1-75 ppb for CS2. The minimum detectable concentrations by the method were 200 ppt for H2S and SO2 and about 50 ppt for COS and CS2.

47762 **APTIC NO. 69688**

Ichihara, Akira

ACCURACY OF MEASUREMENTS OF SULFUR DIOXIDE EXHAUSTED AMOUNT. *(SO2 haishutsuryo sokutei no seido ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 23(4):163-168, April 1974. 9 refs.*

The exhausted amount of sulfur dioxide is obtained by one of the following three methods: (1) measurements of SO2 concentration in exhausted gases and its flow rate; (2) SO2 concentration in exhausted gas, oxygen concentration, and flow rate of heavy oil; and (3) SO2 content in and flow rate of heavy oil. The accuracy of measurements is determined by asummation of accuracies of the various measuring processes concerned. The error limits (+ or - %) of those measurements in (1) are 0.1% in water content 1% in fluctuation of atmospheric pressure, 1% by interference by other compounds, 3% from instability of instruments, and 2% due to standard gas (all of which yield errors in SO2 concentration), 5% from water content in exhausted gas, 2% and 1.5% from measurements of temperature and pressure, 2% in flow rate of exhausted gases and 0.5% in computer calculations. Total random error in method (1) is 7.1% and -4% systematic error arises from measurement of SO2 absorption into water. Errors arising in method (2) are 0.1% in water content, 1% from fluctuation of atmospheric pressure, 1% from interference by other compounds, 3% from instability of instruments, 2% from standard gas (all of which yield errors in SO2 concentration), 0.1% in water content, 0.7% from atmospheric pressure change, 1.3% from instability of instruments (all of which yield errors in oxygen concentration), 5% from theoretical combustible gas amount, and 0.5% in computer calculations. The total random error in method (2) is + or -7% and -4% systematic error arises from the absorption of SO2 into water. The random errors in processes of method (3) are 0.5% in the carbon to hydrogen ratio of heavy oil, 0.5% in sampling temperature, 0.5% in sampling pressure, 1% from standard sample (all of which yield errors in sulfur concentration in heavy oil), 0.2% from the density of heavy oil, 0.2% in heavy oil flow rate and 0.5% from computer calculation. The total random error is + or - 1.5%. Plus 2% and + 0.5% of systematic errors arise from the measurements of vanadium and nickel contents in oil which cause +2.5% total systematic error in SO2 content in method (3).

47763 **APTIC NO. 66758**

Innes, William B.

THERMOCATALYTIC DETECTION OF NOX IN VEHICLE EXHAUST. *Preprint, American Chemical Society, Los Angeles, Calif., 8p., 1974. 3 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., April 1974.)*

A system for thermocatalytic detection of nitrogen oxides is described along with test results from measurements on light combustion gases and automobile exhaust streams. Sample gas is syringe injected into a gallon bottle containing room air, followed by insertion of the sampling probe into the bottle; ammonia may also be added via a capillary to the gas stream. After preheating the mixture passes through the catalytic reactor containing a vanadia catalyst and a glass coated chromel-constantan thermocouple detector and then exits into a vacuum pump. The detector output is measured with a microvoltmeter, with a reading of 80 microvolts corresponding to about a 1 C temperature rise. Findings are reported for various temperatures, flow rates, and ammonia/nitric oxide ratios, with the results appearing consistent with a highly exothermic first order reaction of high rate above 300 C. Tests for possible interferences from carbon monoxide and hydrogen in vehicle exhaust gases were conducted for 1% levels of H2 and CO on response to 540 ppm NO at a 2:1 NH3/NO at 1.0 CFH at 395 C and indicate no detectable effect from the CO or H2. Tests conducted on light combustion gases for sulfur dioxide interference at levels up to 0.5% also indicated no significant effect at 1 CFH and 395 C.

47764 **APTIC NO. 69234**

Ishiguro, Tomohiko

BAD ODOR MEASUREMENT METHODS AND SOME POINTERS. *(Akushu busshitsu no sokutei hoho to ryui jiko). Text in Japanese. p. 40-45, 1974. 3 refs. (Presented at the Bad Odor Pollution Control Seminar, 2nd, Tokyo, Japan, July 23-24, 1974.)*

Ammonia is collected by sampling air through a sulfuric acid fiter paper which is washed with sodium hydroxide solution. After the addition of a buffer solution, chloramine T, and pyridine-pyrazolone solution, it is extracted with carbon tetrachloride and the absorbance is measured near 450 nm. The fiber glass filter used for the analysis must be pretreated by heating at 500 deg for 1 hr followed by impregnating with H_2SO_4 solution follwed by the addition of a sodium hydroxide solution. The amines are then driven to a condensing tube ready for gas chromatographic analysis. For trimethylamine, the column is packed with diglycerol 15% + tetraethylenepentamine 5% + potassium hydroxide 2% on Chromosorb W, AW, DMCS. For the separation of amines, the column is packed with Chromosorb 103 or Squalene 25% + KOH 2% on Chromosorb 104. Moisture in the column causes variation of the retention times of amines. Sulfur compounds are condensed in condensing tube using liquid oxygen and analyzed by gas chromatography (GC) with a column packed with 25% T.E.C.P. and polyphenyl ether as a partition agent. Aldehydes in air are collected in a 2N hydrogen chloride solution containing 1% 2,4-dinitrophenylhydrazine and are then extracted by n-hexane. The sampe is analyzed by GC with column packed with 1% OV-17 on Chromosorb W, AW, DMCS.

47765 **APTIC NO. 69866**

Ishizuka, Kenichi and Shizuo Sato

IMPROVEMENT ON THE JACOBS-HOCHHEISER METHOD (2). *(Jacobs- Hochheiser ho no kairyo ni tsuite (2)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):183, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 35.)*

The improved Jacobs-Hochheiser method utilizes n-butyl alcohol and guaiacol which are neutralized by hydrochloric acid. The new method improves on the conventional solution by producing a more stable color, providing greater nitrogen dioxide absorption, and giving higher accuracy and precision. A comparison was made between the new method and the Saltzman method using nitrogen dioxide gas, and resulted in an equivalence factor of 0.79.

47766 **APTIC NO. 69259**

Iwasaki, Yoshiteru

INTERPRETATION OF THREE POINT COMPARISON TYPE ODOR BAG METHOD. *(Santen hikakushiki shutaiho no kagaekata ni tsuite). Text in Japanese. Preprint, Bad Odor Pollution Study Group (Japan), p. 55-58, 1974. (Presented at the Bad Odor Pollution Control Seminar, 2nd, Tokyo, Japan, July 23-24, 1974.)*

The odor bag method is usually carried out by giving three bags, two with fresh air and one with properly diluted odor, to individuals for identification. When the odor concentration is high, the probability of being correctly identified is almost 1.0, and when it is very low, the probability is close to 0.33. An equation concerning the relation between diluting ratio and the probability can be approximated from a theoretical curve. Resolution of the equation by least square method gives the reciprocal of the diluting ratio and a constant which determines the reproducibility or the sensitivity. The method is an ideal substitution of the conventional ASTM syringe method which has the advantage of less objective and low accuracy.

47767 **APTIC NO. 69860**

Izumikawa, S., K. Nakano, K. Asakino, and T. Ohira

DYNAMIC CALIBRATION FOR AIR POLLUTION MONITOR USING A BAG. *(Bagu ni yoru taiki osen jido sokuteiki no doteki kosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):180, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 32.)*

The preparation and stability of low concentration standard gases to calibrate analytical instruments used for air pollution analysis are described. Preparation consisted simply of the dilution of high concentration, commercially available standard gases with research grade nitrogen gas or air in a bag. Different types of bag material (aluminized polyethylene terephthalate, tetrafluoroethylene, and tetrafluorovinyl) were used to test the stability of the gases within the bag. The aluminized polyethylene terephthalate bag gave the least stability for nitric oxide. The dilution by nitrogen gas resulted in more stability for NO gas than the dilution by air.

47768 **APTIC NO. 70293**

Jutzi, W.

PROBLEMS OF LOCAL AND FAR REACHING AIR QUALITY MONITORING. *(Probleme der lokalen und weitraeumigen Luftueberwachung). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 125-132. 3 refs. (June.)*

After leaving the source, air pollutants enter the atmosphere where they are mixed with ambient air, distributed and transported off or even converted to different substances. All these processes taking place in the atmosphere are called transmission. Monitoring of emission may not always and everywhere provide enough information on the condition of the ambient air. Since forecasting of immissions by means of emissions and transmissions is relatively unreliable, immission measurements are required. Immissions can be measured at individual points (point measurements) or at many points within one area. Experience has shown that much information on the immission situation can be obtained from 100 individual measurements per station, provided they have been taken on 100 days uniformly distributed over the calendar year at randomly varied times of the day. The results provide a rough picture of the immission situation on the basis of which decisions for further measurements can be taken.

47769 **APTIC NO. 68441**

Kaestner, Fritz, Klaus R. Kuhn, and Gerd Loch

AUTOMATIC X-RAY SPECTROMETER FOR ENVIRONMENTAL PROTECTION. *(Automatisches Roentgenspektrometer fuer den Umweltschutz). Text in German. Elektrotech. Z. B, 26(21):554-557, 1974. 9 refs.*

A high-performance, high-precision X-ray spectrometer for the simultaneous detection and quantitative determination of up to 17 elements in air and other media is described. The particulate pollutants present in the air are retained on filter paper which is then directly fed into the spectrometer for analysis. Both the sampling and analytical procedure can be automated. The limit of detection, related to one sq cm of the filter surface and a measuring time of 100 sec, amounts to 580 nanograms for sodium, 90 nanograms for magnesium, 15 nanograms for aluminum, 6.7 nanograms for silicon, 2.2 nanograms for chlorine, 1.2 nanograms for potassium, 2.3 nanograms for calcium, 7.3 nanograms for vanadium, 12 nanograms for iron, 17 nanograms for nickel and zinc, 24 nanograms for copper, 5.8 nanograms for cadmium, 32 nanograms for lead, and 7.2 nanograms for sulfur.

47770 **APTIC NO. 70134**

Kaslow, David E. and Raymond J. Emrich

PARTICLE SAMPLING EFFICIENCIES FOR AN ASPIRATING BLUNT THICK-WALLED TUBE IN

CALM AIR (FINAL REPORT). *Lehigh Univ., Bethlehem, Pa., Dept. of Physics, Bureau of Mines Grant GO110235, TR-25, 72p., May 15, 1974. 6 refs.*

NTIS: N74-26792

During the sampling of dust-laden air by drawing the medium into an inlet, some larger particles fail to follow the air, and thus, a true sample is not obtained. Inertia prevents the particles from accelerating with the air as well as from turning sharp bends; also, the particle s weight causes them to fall relative to the air. An analytical solution to the sampling efficiency calculation by Levin gives particle paths and sampling efficiencies for various particle sizes when the inlet can be treated as a point sink. However, the flow field in the neighborhood of an aspirating tube is quite different from a point sink flow. Employing Levin s solution in the outer field, trajectories in actual flow fields were calculated by a computer to locate the critical trajectories separating the entering particles paths from those paths where the particles hit the tube wall or escape. Sampling efficiencies are presented in terms of three variables -- a dimensionless particle size coefficient, a dimensionless orifice size coefficient, and the tube orientation -- for the no-wing case. Over most of the range of sampling conditions, the Stokes drag law can be used and dependence on the variable (particle Reynolds number) can be ignored. A procedure for achieving maximum efficiency in design of a sampler is proposed. It is not known whether these results apply when typical room-sized eddies constitute the calm air environment. (Author abstract)

47771 **APTIC NO. 69987**

Katzman, L., R. Lisk, and J. Ehrenfeld

EVALUATION OF INSTRUMENTATION FOR MONITORING TOTAL MERCURY EMISSIONS FROM STATIONARY SOURCES (FINAL REPORT). *Abcor, Inc., Cambridge, Mass., Walden Research Div., Environmental Protection Agency Contract 68-02-0590, Proj. 26AAN, Program Element 1AA010, EPA-650/2-74-039, 154p., June 1974. 32 refs.*

NTIS: PB 238 323/AS

Current monitoring instrumentation for the measurement of total mercury emissions from stationary sources were identified and evaluated. The uniformity of response of each instrument to expected forms of Hg emissions from stationary sources including particulate and organic Hg compounds as well as elemental Hg was established. Field tests were conducted at these sources: secondary processing of Hg; chloralkali production; and nonferrous (Zn) smelting. Total Hg emissions from certain sources, in particular, chloralkali plants, can be measured with available Hg measuring instrumentation if adaptations are made. (Author abstract modified)

47772 **APTIC NO. 69759**

Kikuchi, Kaku, Hideyuki Kohamatsu, and Mitsu Sone

INVESTIGATION OF MEASURING METHOD OF ACROLEIN IN EXHAUSTED GASES BY 4-HEXYLRESORCINOL METHOD. *(4-hekishirurizorushinoru ho ni yoru haigasu chu akurorein nodo sokuteiho no kento). Text in Japanese. Miyagiken Kogai Gijutsu Senta Hokoku (Miyagi Pref. Pollut. Contr. Tech. Center Rep.), no. 2:28-31, April 1974. 3 refs.*

Acrolein, a possible air pollutant, was found in exhausted gases from various factories and from automobiles, and its concentration was conventionally determined by colorimetry, tryptophan method, or fluoroglucinol method. These methods, however, did not have enough sensitivity to detect acrolein concentration at the ppm level, and, moreover, was disturbed by coexisting gases like aldehydes. Applicability of the 4-hexylresorcinol method to acrolein analysis was investigated in the present study. Mercuriic chloride (0.3 ml), 0.15 ml of n-hexane, and 7.5 ml of TCA solution were added into 7.5 ml of alcohol containing 0 - 10 micrograms of acrolein and the relationship between acrolein concentration and absorbance of solution was calibrated after leaving the solution for 3.5 hr at room temperature. The standard solution was unstable and it must be used within 48 hr from preparation and be maintained at -20 C. Although the slope of calibration plot depended upon conditions of the preparation, linearity of acrolein concentration against absorbance was quite good. Morever, determination was not disturbed by the existence of trimethylamine, ammonia, or methylmercaptan. As an actual example of application of this method, acrolein contents were determined in exhausted gases from a heavy oil boiler, a fish treatment factory exhaust passed through a degassing device of combustion, a fish treatment factory exhaust passed through a water washer, and from an automobile. No acrolein was detected in the gases from the first two, while about 0.7 ppm of acrolein was detected in the gases from the third and fourth source.

47773 **APTIC NO. 69867**

Kimoto, Toshio, Keiich Sakamoto, and Unji Yuyamo

THE CALIBRATION OF OZONE, NITRIC OXIDE, AND NITROGEN DIOXIDE. *(Gasu taitoreshion ni yoru ozon NO NO2 ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):181, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 33.)*

The linearity of a nitrogen dioxide converter is tested. Ozone and a standard nitric oxide gas were mixed in the converter, and the effluent gas was analyzed for ozone and total nitrogen oxides contents. The results were plotted for ozone concentration versus NO concentration and gave a linear slope. This titrimetric method of NO2 calibration is more convenient and more accurate than the permeation tube technique.

47774 **APTIC NO. 65192**

Kleppe, John A., Roger L. Steele, and Paul E. Testerman

A SELF CALIBRATING MONITORING NETWORK WITH CENTRALIZED DATA ACQUISITION AND CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-22.)*

For over 4 years, an atmospheric survey has assessed the effects of a large (1600 mw) coal burning power plant on the atmosphere. Instrumentation consists of a network of nitrogen dioxide and sulfur dioxide monitors, meteorological instrumentation, and a data acquisition system with associated telemetry. Remote control and data for these instruments is telemetered over a single voice grade telephone line by utilizing a combination of time and frequency multiplexing techniques. A master control station provides a time record, real time display of data, and a permanent data tape for use in later analysis. Calibration equipment, consisting of permeation tubes, is automatically controlled from a master control station so that the instrument calibration is checked daily. The processed data therefore includes measurements verified by daily calibration. The test and evaluation program to characterize the calibration equipment, e.g., to allow temporal variation in permeation tube output, is described. The measurement system, data acquisition methods, and analysis procedures are described in detail, along with a discussion of the limits of accuracy and precision in the network. The complexity of the program is justified by the abnormally low levels of pollution encountered in the network along with a continuing need for long-term verified pollutant levels. (Author abstract modified)

47775 **APTIC NO. 70275**

Kobayashi, Toshiro and Michihiro Sumi

ACCURACY OF THE SALTZMAN MANUAL ANALYSIS METHOD FOR THE NOX MEASUREMENT IN THE AIR. *(Taikichu no NOx sokutei o mokuteki to shita Zarutsuman tebunsekiho no bunseki seido ni tsuite). Text in Japanese. Kansai Denryoku Sogo Gijutsu Kenkyusho Hokoku (Kansai Elec. Gen. Tech. Res. Inst. Rep.), no. 13:160-164, March 1974.*

In the case of nitrogen oxides measurement by the Saltzman method using portable automatic samplers for sampling, the effect of coloration temperature, flowmeter errors, and differences in flow resistance of impingers were investigated. In the case of nitrogen dioxide measurement, at lower concentrations of approximately 0.01 ppm, the standard deviation of measured value was 0.0006 ppm and variation rate was 8.6%; and at higher concentrations of approximately 0.08 ppm, the standard deviation was 0.003 ppm and variation rate was 3.8%. The accuracy of nitric oxide measurement was similar to that of NO2. The accuracy of analysis could be improved greatly by correcting the indicator graduation of flowmeter using the standard wet gas meter, the use of impingers with flow resistance errors within + or - 2%, the standardization of time for coloration of absorption solution, and frequent changing of oxidizing solution for NO.

47776 **APTIC NO. 70079**

Laitinen, H. A.

ANALYTICAL CHEMISTRY IN INTER-DISCIPLINARY ENVIRONMENTAL SCIENCE. *Analyst (London), 99:1011-1018, 1974. 15 refs.*

The traditional role of analytical chemistry in environmental science deals with monitoring air, water, and food for pollution and with the techniques for setting and enforcing legal pollution control standards. The importance of an expanded role for the analytical chemist as a participant in inter-disciplinary research in environmental science is emphasized. Such research may involve the major environmental units, namely air, soil, water, plants, and animals, or subdivisions of those units into smaller and smaller sub-units down to the molecular level. At each stage, the analytical chemist is called upon to answer increasingly detailed questions about environmental pollutants, including distribution on a macro- or micro-scale, the physical and chemical form of the pollutant, the nature of its interaction with its substrate, and the rates of transfer from one location to another or from one form to another. A number of examples are given to illustrate the depth and variety of problems confronting the analytical chemist in such research. (Author abstract modified)

47777 **APTIC NO. 65540**

Lapson, W. F., H. Dehne, and D. B. Harris

THE DEVELOPMENT AND APPLICATION OF A HIGH VOLUME SAMPLING TRAIN FOR PARTICULATE MEASUREMENTS OF STATIONARY SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p. 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-189.)*

The development and application of a high volume sampling train for particulate measurements of stationary sources are described. The new train can be used at flow rates up to nearly 6 cfm, or at least six times the flow rate of the more conventional sampling train. The system can be unpacked and set up for use in a matter of minutes. The high volume sampling train was tested together with a standard sampling train under controlled conditions. The high volume train acquires a sample in about 1/4 the time of a standard sampling train. At grain loadings of 0.04 grain/cu ft and an effluent velocity of 60 fps, the high volume sampler can easily acquire the three samples required for Method 5 in a single day of testing. (Author abstract modified)

47778 **APTIC NO. 65193**

Lawrence, George F. and Edward Ward

REMOTE SENSING OF URBAN AMBIENT AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting 67th, Denver, Colo., June 9-13, 1974, Paper 74-23.)*

The feasibility of using satellite sensors to measure air quality and air pollution from lower altitude platforms such as aircraft and helicopters is discussed. Data output from remote sensing systems was compared with output from mathematical, air pollution dispersion models, using Washington, D. C. as the test city. Attempts were made to determine which satellite sensors could be used or modified for high resolution coverage at low altitudes and the utility of such systems in supporting ground based urban air monitoring systems. Using a simulation technique, advanced sensors like tunable lasers, correlation interferometers, and gas filter correlation instruments were modeled and studied to see how well they could perceive the areal and temporal variations produced by the dispersion models. The instruments tested were the carbon Monoxide Pollution Experiment (COPE), CIMATES-Multi-Pollutant-COPE, DARS-Tunable Laser Heterodyne Radiometer, FGCA-Gas Filter Correlation Instrument, Modified GFCA-Gas Filter Correlation Instrument, MAPS-Gas Filter Correlation Instrument, HSI-High Speed Interferometer, LACTATE-Multichannel Infrared Radiometer, and LIDAR-Multiple Wavelength Laser Radar. The distributions of carbon monoxide and sulfur dioxide over Washington, D. C. were obtained using quasi-steady multi-source Gaussian plume models and using these instruments and compared. The GFCA and the COPE instruments were closest to an operational status and should be included in any low altitude air monitoring system. Dramatic improvements on resolution can be obtained by reducing the time constant of the instruments. To make the transition from satellite to aircraft operations, the instrument time constant, time to scan and field of view may all need modification. The DARS instruments showed a great deal of promise. The LACTE and HSI instruments showed very little applicability to an airborne urban monitoring system. (Author abstract modified)

47779 **APTIC NO. 69560**

Lee, R. N.

POTENTIAL APPLICATION OF ATOMIC ABSORPTION AND ANODIC STRIPPING VOLTAMMETRY TO THE PRECIPITATION SCAVENGING PROGRAM. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 1-3, April 1974.*

NTIS: BNWL-1850 PT3

Results from atomic absorption and anodic stripping voltammetric analyses of rain samples for silver and indium are compared to those obtained from the same samples using neutron activation analysis. Flameless atomic absorption was used for the silver analysis, and anodic stripping voltammetry was used for the indium analysis. The precipitation samples from an in-cloud scavenging experiment were concentrated to dryness in plastic vials for neutron activation analysis comparison runs. The data for neutron activation analysis and atomic absorption analysis of silver are generally in good agreement, with the former method giving concentrations below 1 ng silver in all but one sample and the latter method giving values ranging from 0.10-0.85 ng silver. The thermal stress experienced by the vials during neutron activation contributed to migration of some of the tracer into the container walls. The data recorded for the anodic stripping voltammetric analyses of indium are generally in keeping with the expected irreversible loss of indium to the plastic vial. This method of analysis offers no advantage in terms of detection limit when compared to neutron activation analysis.

47780 **APTIC NO. 69574**

Lee, R. N. and M. C. Miller

A REAL-TIME SYSTEM FOR DETECTION OF THE ATMOSPHERIC TRACER SULFUR HEXAFLUORIDE. *In: Pacific Northwest Laboratory Annual Report for 1973* *to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 80-86, April 1974. 31 refs.*

NTIS: BNWL-1850 PT3

A sulfur hexafluoride tracer gas detection system built for aircraft operation is described along with some preliminary field test results. The primary component of the system is a gas chromatograph equipped with an electron capture detector. During operation, a continuous flow of an atmospheric sample through a column possessing an affinity for oxygen allows real-time description of an SF6 plume before arrival of the oxygen frontal. The column, which is rejuvenated by an argon backflush, permits sampling for 1 minute intervals during each 6 to 8 min of flight time. Releases for aircraft sampling were made from a 400 ft tower and had a source strength of less than 1 cfm. Plume observations were made for up to 29 km. (Author abstract modified)

47781 **APTIC NO. 69522**

Libergott, Esther Kerdman, and Angela Gonsalves da Silva

NEW ORGANIC REAGENT TO IDENTIFY AND DETERMINE MINUTE QUANTITIES OF LEAD. *(Novo reagente organico para identificacao e determinacao de chumbo). Text in Portuguese. Inform. Inst. Nac. Tecnol., 7(4):47-50 July-Aug.-Sept. 1974. 7 refs.*

A spectrophotometric method involving the use of a new reagent for the identification and quantitative determination of trace quantities of lead in various media is described. The sample containing the lead is combined the reagent obtained by the condensation reaction of isatin with 2-hydrazine benzothiazole in the presence of dilute acetic acid, and also concentrated ammonia, and subsequently chloroform is added. A vermillion- colored precipitate indicates the presence of lead. The effect of interferences due to other metals can be minimized by the addition of ammonium tartrate, alkaline cyanide, and, in the case of thallium, of potassium iodide. The limit of detection is 0.25 micrograms in the absence of interference; it amounts to 1 microgram in the presence of 500 micrograms of mercury or cadmium; to 2 micrograms in the presence of 500 micrograms cobalt and nickel; and to 5 micrograms in the presence of 500 micrograms of manganese, bismuth, copper, palladium, osmium, or thallium. For quantitative determination, the chloroform extract of the isatin-benzothiazole hydrazone-lead complex is analyzed in a spectrophotometer at an absorption peak of 510 nanom.

47782 **APTIC NO. 69532**

Magliulo, Anthony R.

AN INEXPENSIVE AIR SAMPLING DEVICE. *BioScience, 23(11):654, 1974 (?).*

An inexpensive, non-mechanical, portable air sampling device which can be easily constructed from an aspirator bottle is described. The aspirator bottle is fitted at the top with a one-hole rubber stopper containing on L-shaped length of glass tubing whose horizontal inlet portion is fitted with a short length of rubber hosing for connection of the aspirator bottle to the air sampling medium. The liquid culture medium (or sterile saline) is dispensed in culture tubes fitted with stainless steel caps and sterilized by autoclaving. When air samples are to be otained, the steel cap is removed and replaced by a presterilized attachment piece consisting of a two-hole rubber stopper containing two lengths of L-shaped glass tubing. The glass tubing which connects to the aspirator bottle is short and extends vertically to just slightly beyond the rubber stopper at its lower extremity. A second length of glass tubing, which serves as an air inlet, extends almost to the culture medium. Both lengths of tubing have loose cotton plugs at their orifices to prevent air contamination of the medium prior to aspiration. The aspirator bottle is filled with water to just below its vertical inlet tubing in actual use; and, since all connections are airtight, a volume of air will be drawn through the medium which equals the volume of water drained through the aspirator outlet by opening the pinch clamp. Aliquots of the exposed medium can be removed and used in the preparation of quantitative pour plates, thus permitting the determination of numbers of various microorganisms. The device can also be used for detection and quantification of chemical air pollutants by replacing the culture medium with appropriate chemical reagents.

47783 **APTIC NO. 69621**

McClenny, W. A., F. W. Baity, Jr., R. E. Baumgardner, Jr., R. A. Gray, R. J. Gillmeister, and L. R. Snowman

DEVELOPMENT OF A GAS LASER SYSTEM TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES: VOLUME II - FIELD EVALUATION OF GAS LASER SYSTEM FOR OZONE MONITORING FINAL REPORT. *National Environmental Research Center, Research Triangle Park, N. C., Chemistry and Physics Lab. and General Electric Co., Pittsfield, Mass., Electronic System Div., Environmental Protection Agency Contract 68-02-0757, ROAP 26ACX, Program Element 1AA010, Rept. EPA-650/2-74-046-b, 52p., July 1974. 5 refs.*

NTIS: PB 236679/AS

A breadboard laser long path monitor called ILAMS (Infrared Laser Atmospheric Monitoring System) which was modified to improve its sensitivity is described along with field evaluations of real time ambient ozone measurements using the open-path monitor. The system operates in the middle region of the infrared spectrum and identifies atmospheric constituents by absorption spectroscopy, measuring average pollutant concentrations (total burden) over its optical path. Laser operation is at relatively low, safe power densities of 0.001-0.01 watts/sq cm in the spectral region where the eye does not transmit. The spectrally scanning laser itself includes a high gain carbon dioxide flowing gas laser as the radiation source and a wavelength selection mechanism which periodically (50 Hz) scans through a series of four laser wavelengths. The collection and reduction of data is entirley under computer control. The studies establish the sensitivity of an open-path monitor, based on transmissivity measurements of CO2 laser lines, at less than or equal to 5 ppb and validate values obtained during real-time monitoring of ambient ozone by establishing and using a methodology for the comparison of point monitor readings and open-path monitor readings over a common path.

47784 **APTIC NO. 65191**

McKee, Herbert C.

COLLABORATIVE TESTING OF METHODS TO MEASURE AIR POLLUTANTS. III. THE CHEMILUMINESCENT METHOD FOR OZONE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-19.)*

The results of a collaborative test of a chemiluminescent method to measure ozone are presented. The test involved the analysis of an urban atmosphere containing a photochemical smog mixture. Ten laboratories participated in a test at Pasadena, California, where a sampling manifold and other equipment were set up to permit simultaneous measurement by 10 instruments. Ozone generators were used to increase the O3 level over that naturally occurring, in order to cover an adequate range of concentrations. The range tested was 0-0.5 ppm. A statistical analysis of the data showed that the repeatability varied linearly with concentration according to the formula: repeatability equals 18 + 0.07 times concentration (micrograms/cu m). The reproducibility varied nonlinearly with concentration for concentrations less than 300 micrograms/cu m according to the formula: reproducibility equals 18 + 0.11 times concentration (micrograms/cu m). For concentrations exceeding 300 micrograms/cu m, the reproducibility is 17% of the concentration present. The minimum detectable limit depends on instrumental variables such as the operating range selected, and thus will vary depending on design and operating characteristics of a particular instrument. Under a typical set of assumptions, the repeatability at 0 concentration can be used as an estimate of the minimum detectable limit. This figure is 18 micrograms/cu m (0.009 ppm), and therefore a lack of sensitivity should cause no significant limitations in the normal use of this method for ambient monitoring. (Author summary modified)

47785 **APTIC NO. 69199**

McNesby, James R.

PROBLEMS IN THE MEASUREMENT OF FREE RADICAL CONCENTRATIONS IN THE ATMOSPHERE. *Ber. Bunsen-ges. Physik. Chem., 78(2):158-162, 1974. 9 refs.*

The free radicals known or suspected to be present in the earth s stratosphere include oxygen (O), oxygen molecule (O2), sulfur oxide (SO), hydrogen (H), hydroxyl (OH), hydrogen dioxide (HO2), CH, aldehydes (CHO), methyl (CH3), CH3O, CH3O2, NH, NH2, HNO, nitric oxide (NO), nitrogen dioxide (NO2), and nitrogen trioxide (NO3). In the urban troposphere near ground level, this list can be greatly expanded to include many species resulting from reactions of these simple radicals with reactive hydrocarbons. Since the economical control of air pollution requires a detailed knowledge of the chemical kinetics involved in removal of stable pollutant molecules from the air, it is desirable ultimately to be able to measure the concentrations and rate constants of all such reactants. The two most abundant, polar atmospheric free radicals NO and NO2 were selected for discussion. The ground states of NO and NO2 qualify both molecules as free radicals. These molecules pollute the urban atmosphere and stratosphere, and the debates about the amounts in which they are present have precipitated major controversies in the U. S. and elsewhere. The nature of the tropospheric NO and NO2 problem is discussed. Their measurement, the state of the art, their health effects, measurements of their health effects, the automobile problem, and approaches to the solution of the problem of nitrogen oxides in terms of the basic Federal legislation are discussed. An air pollution emission model is also described. (Author abstract modified)

47786 **APTIC NO. 67035**

Michel, H. V. and Frank Asaro

NEUTRON ACTIVATION ANALYSIS OF PARTICULATE MATTER IN AIR. *In: Nuclear Chemistry Annual Report 1973. California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission Contract W-7405-eng-48, Rept. TID-4500-R61, UC-4, Chemistry, p. 407-409, 1974.*

NTIS: LBL-2366

Neutron activation analysis is performed on airborne particulate matter from the Pasadena, California area to determine modifications necessary for the conversion of analytical techniques developed for pottery analysis to the analysis of air pollutants. Measured weights and standard deviations are listed for the following elements: aluminum, magnesium, calcium, vanadium, chlorine, bromine, sodium, manganese, strontium, potassium, gallium, uranium, samarium, tungsten, cadmium, mercury, arsenic, titanium, tantalum, cobalt, scandium, silver, iron, cesium, antimony, tin, iridium, chromium, thorium, Ew, barium, nickel, rubidium, terbium, hafnium, zinc, and selenium.

47787 **APTIC NO. 65189**

Miller, David F. and Chester W. Spicer

A CONTINUOUS ANALYZER FOR DETECTING NITRIC ACID. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-17.)*

The formation of nitric acid in the polluted atmosphere was monitored in simulated smog and in the field using a newly developed analyzer. The analytical method, the operation and performance of the analyzer, and some results of recent applications are described. The analysis consists of sample conditioning in combination with a Mast microcoulomb detection cell adapted for sensing acids rather than oxidants. Results of calibration and interference testing are presented. The sensitivity of the instrument to nitric acid was about 2 ppb. In the simulated smog experiments with synthetic automobile exhaust, the pattern of HNO3 formation paralleled that of ozone formation. A similar formation pattern was observed during ambient sampling. Evidence is presented which suggests that the following reactions may both contribute to HNO3 formation in smog, but the relative importance of the two is uncertain. They are nitric anhydride + water yields 2HNO3 and hydroxyl radical + nitrogen dioxide (+M) yields HNO3(+M). Atmospheric sampling in the Los Angeles area indicated 24-hour concentrations of about 3 ppb and 1-hour average maximum concentrations of about 10 ppb. (Author abstract modified)

47788 **APTIC NO. 65204**

Miller, Kenneth and Henk W. De Koning

PARTICLE SIZING INSTRUMENTATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-48.)*

Various particle size fractionators, including the Andersen Non-viable Air Sampler, the BGI Cascade Centripeter, the R. A. C. Fractionating Particulate Sampler, the Andersen, the BGI-30, and the Sierra Hi-volume Cascade Impactors, are evaluated. Ambient air monitoring of suspended particulates is undertaken to determine their size distribution and their effects on human health, visibility in the atmosphere, material deterioration, soiling, particle-particle, and particle-gas interactions. The data gathered also permitted the study of the following: precision of hi-volume samplers; effects of flow rate on accuracy of suspended particulate concentrations using hi-volume samplers; correlation of total suspended particulate measurements as determined by the hi-volume and the particle sizing intruments; comparison of the mass median diameter measured by the various impactors; and ease of operation and maintenance. A sampling station was constructed in a high particulate loading residential area in Windsor, Ontario. The samplers are positioned 2.5 to 3 feet apart, with intakes being approximately 4.5 to 5 feet above ground level. All samplers are operated on a 5-day sampling schedule. The hi-volume measurements obtained at the same flow are comparative. There is a significant effect of flow rate on total suspended particulate concentration. There is a significant sampler effect on total suspended particulate measurements and on mass median diameter. The Andersen, BGI-30, and Sierra hi-volume impactors can be used in place of the standard hi-vol for T. S. P. determinations if empirical relationships are developed. There is a definite requirement for research into the calibration and operation of particle fractionating instruments in the field. (Author abstract modified)

47789 **APTIC NO. 69952**

Mitchell, William J. and M. Rodney Midgett

EVALUATION OF THE EPA METHOD FOR THE DETERMINATION OF MERCURY EMISSIONS FROM STATIONARY SOURCES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Methods Standardization and Performance Branch, 29p., Oct. 1974. 6 refs.*

An in-house evaluation of the precision capabilities of the EPA sampling train applicable to mercury cell chlor-alkali plants and primary mercury smelters determined that the sampling train itself gives reproducible results. This conclusion was drawn from a study that compared the performance of four identical sampling trains that had simultaneously sampled at essentially the same point in the hydrogen vent gas from a mercury cell chlor-alkali plant. The within-run (inter-train) differences measured were attributed primarily to variances in the sample recovery technique. The mercury samples collected were used to evaluate the precision capabilities of the flameless atomic absorption analytical procedure applicable to mercury sources. The evaluation was accomplished by dividing each sample into six portions and by submitting one portion from each sample to five independent laboratories for analysis by flameless atomic absorption. The sixth portion was analyzed by neutron activation analysis. The results obtained from the five laboratories showed that, as written, the promulgated flameless atomic absorption procedure does not give reproducible results. The results do indicate that if the procedure is rewritten to clarify certain sections and to include essential details that are now missing, then its precision might be considerably improved. An improved method is being developed. (Author abstract)

47790 **APTIC NO. 67046**

Morgan, George B.

ASSESSMENT OF AMBIENT AIR QUALITY IN THE UNITED STATES. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 4, p. 69-108. 27 refs.*

The surveillance of ambient air quality in the U. S. today is aimed toward systematic collection and evaluation of aerometric and related data to provide information on pollutant concentrations in the ambient air, on emissions from pollution sources, and on meteorological conditions. The accounting of air pollutant sources and their related emission rates for a given area is defined as an emissions inventory. Air pollution source categories include fuel combustion in stationary sources, fuel combustion in mobile sources, industrial processes, solid waste disposal, and evaporation of organic substances. The emissions inventory techniques to delineate sources and emissions in an area and survey procedures including inventory design, collection of basic data, and calculation of emissions are discussed. The role of monitoring in assessments, monitoring systems (fixed versus mobile sampling and continuous versus integrated sampling), and selection of instrumentation and measurement methods are also described. Methods for measuring sulfur dioxide include impinger, coulometric, colorimetric, conductometric, flame photometric, and silica gel; methods for measuring suspended particulates include hi-vol, membrane filter sampler, tape sampler, smokeshade, cascade impactor, nephelometer, and tape sampler. Approximate guidelines are given for estimating the number of sampling sites and their location. The sampling frequency and duration, the design of a data processing system, operation of an air monitoring network, reduction and interpretation of data, meteorological instruments, air quality modeling, and projections of air quality are also discussed.

47791 **APTIC NO. 70252**

Mori, T., K. Terayama, K. Takahashi, and T. Osaki

TOTAL CONTROL AND WASTE GAS MEASUREMENT. *(Soryo kisei to haigasu keisoku). Text in Japanese. Otomeshon (Automation), 19(11):85-88, Nov. 1974. 3 refs.*

A field test was made on the total amount of exhaust smoke emitted by an electric power plant and a petroleum factory. Amount of flue/gas, condition of smoke tower, test methods, and test results are discussed. Testing of the flowmeter for flue gas monitoring was especially noted. The temperature of flue gas is usually 150-300 C, but can be over 300 C if heat recovery is not utilized. Pressure loss caused by testors located in the flue gas must be about zero. Under these conditions, continuous measurement becomes difficult and accuracy is decreased by adherance of dusts and mists in the flue gas on testers. By-product sulfuric acid in flue gases corrodes even at low temperature. The whirl flowmeter used in the experiment succeeds in all cases and shows good accuracy.

47792 **APTIC NO. 69232**

Nakanishi, Eiji, Hiroshi Ono, and Eiichi Keyakida

ANALYSIS OF AIR POLLUTION SYSTEM BY DIGITAL SIMULATION. *(Dijitaru shimureshon ni yoru taiki osen seigyo kei no kaiseki). Text in Japanese. Preprint, Japan Society for Chemical Engineering, Presented at the Symposium on Systems Engineering for Environmental Control, Toyama, Japan, July 18, 1974.*

The simulation and analysis were carried out by feed-back control system using Osaka Prefecture as the air pollution model. Equations were derived for horizontal and vertical diffusion of air pollutants. The multi-variable linear feed-back control system was designed by composing separated systems. A conventional method for designing a separation control system usually has the disadvantage that the design of a adjustment element is impossible to do. This problem was partially solved by specially designing a controller. Calculation results of the digital simulation showed that, for an air pollution system with extremely large delay factors, the efficiency by a feed-back control system was not satisfactory. A feed-forward control system was necessary to increase the efficiency.

47793 **APTIC NO. 69256**

Nishida, Konosuke

ODOR MEASURING DEVICES. *(Shukido sokutei sochi ni tsuite). Text in Japanese. Preprint, Bad Odor Pollution Study Group (Japan), p. 59-83, 1974. (Presented at the Bad Odor Pollution Control Seminar, 2nd, Tokyo, Japan, July 23-24, 1974.)*

Three types of odor detectors were constructed. One apparatus was a fixed type consisted of a bomb with regulator which supplied fresh air of no odor, a constant temperature, constant humidity chamber, a chamber to which air and odor were introduced for detection, and an automatic recorder. Odor and air were introduced to the chamber at a ratio of 1:0 to 1:1000, and odor was tested by increasing its concentration until it was sensed or by decreasing its concentration until it could not be sensed. An outdoor type which consisted of virtually the same parts but was considerably smaller was also constructed. In this apparatus, fresh air containing 79% nitrogen and 21% oxygen and heated at 60 to 80 deg was introduced into various tubes to drive out odors remained on the tube wall. An even smaller field recorder comprised a test odor container (plastic bag), control system of odor flow, a fresh odor container and its flow control system, a diluting chamber and an indicator for diluting ratio. The diluting ratio of the recorder was 1:1 to 1:1000.

47794 **APTIC NO. 69738**

Okuda, Kazuo, Bin Fukui, Masakazu Seki, and Takeichiro Takamatsu

AN OBSERVATION FOR THE OPTIMUM PLAN FOR AIR POLLUTION MONITORING NETWORK. *(Taiki osen kansokubo no saiteki keikaku ni tsuite no ichi kosatsu). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 127-130, 1974. (Presented at the Symposium on Systems Engineering for Environmental Control, Toyama, Japan, July 18, 1974.)*

Characteristics of an air pollution system were evaluated by data obtained from a monitoring network. The average concentration of sulfur dioxide was used as an air pollution indication, and data from 18 monitoring stations scattered in Mizushima area were used for the study. Analysis of the main components was carried out by projecting n points in m dimensions, which gave a maximum distribution out of a total dimension of p. Variance and standard error were calculated from the mean square of pollution concentration. The inherent value and accumulated contributing ratio of a major component were then calculated from the variances. Results from Jan. 1972 to Nov. 1972 revealed that more than 80% of the information was obtained to the third major component. Clustering was also carried out by using the scores of the second major component, which was obtained with every monitoring station as an individual, as variables. The loss of information was not significant even 7 categories were classified for the cluster analysis.

47795 **APTIC NO. 69573**

Orgill, M. M. and P. W. Nickola

EVALUATION OF AN AIRBORNE FLUORESCENT PARTICLE COUNTER FOR ATMOSPHERIC TRACER STUDIES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 75-79, April 1974.*

NTIS: BNWL-1850 PT3

An automatic fluorescent particle counter was evaluated aboard an aircraft for utilizing the instrument in field dispersion, transport, and deposition studies. The sample air plus entrained tracer particles pass into an excitation chamber designed to retain the sample for approximately 500 msec; at least 300 msec are required to excite the fluorescent material to a maximum fluorescence. The diameter of the intake orifice is sized to obtain isokinetic sampling for airborne operation. The fluorescent particle counter appeared to be about nine times more sensitive to fluorescent particle FP3206 than to FP2210. Airborne concentration was a function of crosswind distance in a case where the FP3206 plume was relatively narrow. Sampling of the fluorescent particle plumes for distances over 7 km was disappointing; a distance of 13 km was the limit of plume detection about natural background readings. Sampling of smoke, dust, and industrial type plumes resulted in elevated background levels (10-200 particles/l) near the source and was perhaps due to natural fluorescent materials and spurious scattering effects within the particle counter s sensor pod.

47796 **APTIC NO. 65288**

Parry, Edward P., Raymond A. Meyer, and Walter L. Crider

GAS FLOW MEASUREMENTS IN AIR POLLUTION MONITORING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-55.)*

The characteristics of flowmeters, used by the Community Health Air Monitoring Program (CHAMP) to monitor and measure gas flows in the remote station, and the effect of the nature of the flowing gas are presented. The calibration of mass flowmeters using the soap film flowmeter, the Marriote flask, and the mercury sealed float is compared. Both the soap film flowmeter and the Marriotte flask can give erroneous results when measuring the flow rates of dry gases because of humidification of the gas during measurement. If properly used, the mercury sealed float gives the most accurate results, but if the results for the soap film flowmeter are corrected, it can give results which are accurate to better than 1%. The nature of the correction is discussed. The stability of the mass flowmeters tested is dependent on the individual flowmeter. The data indicate that the stability of each mass flowmeter should be established before it is used for long term air quality monitoring. (Author abstract modified)

47797 **APTIC NO. 67038**

Parsa, B. and S. S. Markowitz

DETERMINATION OF LEAD IN ATMOSPHERIC AIR AND IN ALUMINUM BY 3HE-INDUCED NUCLEAR REACTIONS. *In: Nuclear Chemistry Annual Report 1973. California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission Contract W-7405-eng-48, Rept. TID-4500-R61, UC-4 Chemistry, p. 413-417, 1974. 26 refs.*

NTIS: LBL-2366

Helium-3 activation analysis is described for the trace analysis of lead in atmospheric air and in aluminum. The procedure involves the bombardment of samples with 3He particles to induce the conversion of Pb to Polonium-207, with the 992 keV gamma ray of 207Po being used as the signal for lead determination. Destructive analysis may be carried out if necessary, and a radiochemical separation procedure to plate Po onto a silver foil is presented. The accuracy of the measurement is about 3-5% for comparative analyses, while for absolute determinations the error is estimated to be 9-12%. Under reasonable irradiation and counting conditions, the detection limit is approximately 50 pg/sq cm, corresponding to 0.5 ppb in a matrix 100 mg/sq cm thick. Average atmospheric lead concentrations using the method are shown for downtown Berkeley at various times during the year 1971. (Author abstract modified)

47798 **APTIC NO. 69561**

Perkins, R. W., J. D. Ludwick, C. W. Thomas, M. R. Petersen, and J. A. Cooper

QUILLLAYUTE AIR REFERENCE STATION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 4-16, April 1974.*

NTIS: BNWL-1850 PT3

Activities of the Quillayute Air Base in relation to sampling and monitoring air constituents are described. The air reference station is located in northwestern Washington State about 3 mi inland of the Pacific Ocean. High-volume air filtration provides samples for measuring the concentration of a wide spectrum of radionuclides, while their physical size distribution is determined from high-volume impactor samples. Plans for gaseous radionuclide measurements are also being implemented. Monitoring is currently operative for the gaseous pollutants ozone and nitrogen oxides, while plans for carbon monoxide and sulfur oxides are near completion. Typical ozone levels recorded at the station vary between 20 and 40 ppb; while concentrations of nitrogen oxides vary from 1-4 ppb, with occasional rises to 10 ppb. A constant monitor is also kept on the particulate air levels which show higher concentrations (2000-3000 condensation nuclei/ml) during the summer as compared to other seasons (1000 condensation nuclei/ml). Neutron activation analysis and X-ray fluorescence are used to provide selective multi-element analyses of the particulate samples. The hemispheric concentrations of certain organic constituents are also measured by coordinating the meteorological watch for fresh air masses with certain sampling techniques. Organic components measured include various chlorinated hydrocarbon pesticides.

47799 **APTIC NO. 69351**

Perry, R. and J. D. Twibell

THE COLLECTION AND ANALYSIS OF VOLATILE HYDROCARBON AIR POLLUTANTS USING A TIMED ELUTION CHROMATOGRAPHIC TECHNIQUE LINKED TO A COMPUTER CONTROLLED MASS SPECTROMETER. *Biomed. Mass Spectr., vol. 1:73-77, 1974. 7 refs.*

The difficulty of collecting volatile hydrocarbons, such as benzene, from street air in a form suitable for subsequent analysis is overcome by the use of a time-based elution procedure. By linking this technique to a gas-chromatograph-mass spectrometer-data system, a rapid analysis is possible for low concentrations of collected materials. Among advantages of this novel sample introduction procedure are the facility for collecting organic materials without interference from water vapor and the subsequent introduction of the hydrocarbons into the gas chromatographic-mass spectrometry system without the use of any auxiliary solvents. Consequently, the mass spectrometer can be used continuously on-line, enabling the more volatile materials, normally masked by solvents, to be examined. This procedure is illustrated by the measurement of benzene and other hydrocarbon levels in street air in London. Following gas chromatographic separation, the hydrocarbons can be identified by library search facilities attached to the mass spectrometer. (Author abstract)

47800 **APTIC NO. 69930**

Petrie, S. L. and J. J. Komar

ELECTRON BEAM ANALYSIS OF THE PROPERTIES OF MOLECULAR NITROGEN AND NITRIC OXIDE IN THE AFFDL 2-FOOT ELECTROGASDYNAMICS FACILITY (FINAL REPORT). *Ohio State Univ. Research Foundation, Columbus, Aeronautical and Astronautical Research Lab., Air Force Contract F33615-72-C-1023, Proj. 1426, AFFDL-TR-74-8, 64p., Feb. 1974. 12 refs.*

NTIS, DDC: AD 779087

The electron beam fluorescence technique was used to measure the vibrational temperature and number density of molecular nitrogen and nitric oxide at the exit of the 7-inch conical nozzle of a 2-foot electrogasdynamics facility. The vibrational temperature and species concentration of nitric oxide were also measured at the exit of the 9-inch conical nozzle. Tests were conducted at reservoir pressures of 250, 350, and 500 psia, with reservoir enthalpies varying from 2127 to 5931 Btu/lb. Theoretical results assuming finite-rate chemical nonequilibrium were compared with the experimental data. For the 7-inch nozzle tests, poor agreement between the measured and predicted nitrogen concentrations was obtained. The excitation-emission mechanisms for electron beam excitation of the nitric oxide system in NO-air and NO-nitrogen mixtures were investigated. The excitation was dominated by secondary electrons resulting from beam-induced ionization of molecular nitrogen. Application of the electron beam technique to the measurement of NO number densities showed that the nonequilibrium theory over-predicts the amount of NO present in the expansion process. Reasons for the discrepancies between the theoretical and experimental results are discussed. (Author abstract)

47801 **APTIC NO. 70080**

Pierce, Russell W.

THE DETECTION AND ESTIMATION OF AIRBORNE SULPHUR-CONTAINING COMPOUNDS BY MEANS OF A NOVEL, DRY, ULTRA-RAPID, AND EXTREMELY SENSITIVE METHOD. *ISA (Instr. Soc. Am.) Trans., 13(4):291-295, 1974. 7 refs. (Presented at the Instrumentation Society of America Conference and Exhibit, Annual, 28th, Houston, Tex., Oct. 15-18, 1973.)*

The fast and accurate analysis of sulfur and its compounds is essential for the continuous control of abatement countermeasures. A new instrumental system is described which utilizes the reversible and sensitive surface poisoning of hydrogen-permeable metal membranes or foils to sulfur compounds to measure total sulfur in air or other sources and in the presence of other contaminants. The palladium foil permeators can be used to measure sulfur levels from sulfur dioxide, sulfur trioxide, and hydrogen sulfide. (Author abstract modified)

47802 **APTIC NO. 67113**

Price, B. J. and K. M. Field

THE DIRECT ANALYSES OF S AND PB IN FUELS BY NONDISPERSIVE X-RAY FLUORESCENCE. *Am. Lab., 6(9):62-64, 66, Sept. 1974.*

The direct analysis of sulfur and lead in fuels by nondispersive X-ray fluorescence is discussed. For general fuel oil analysis of S, the range of concentration of interest is from 0.1 to 4%. The accuracy requirements are easily met because the level of precision for the standard instrument is such that a standard deviation better than 0.005% S at the 0.5% level is achieved in a 50 sec analysis time. Lead analysis in gasoline is at a stage where it is possible to produce results suitable for general analysis, and instruments are already being used for routine Pb analysis. Progress in this application for nondispersive analyzers is expected to increase. (Author conclusions modified)

47803 **APTIC NO. 69559**

Rock, Gregory M., Daniel Briehl, and Porter J. Perkins

FLIGHT TEST OF A PRESSURIZATION SYSTEM USED TO MEASURE MINOR ATMOSPHERIC CONSTITUENTS FROM AN AIRCRAFT. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TN-D-7576, Work Unit 501-04, Rept. E-7701, 26p., March 1974. 10 refs.*

NTIS: N-74-19895

A flight evaluation of an ambient air sample pressurization system was conducted at altitudes between 6 and 12 km. The system regulated the sample pressure to 10.15 + or - 0.1 N/sq cm and provided samples flow to three gas analysis instruments included in the system. Ozone concentrations measured by two instruments employing different techniques (electrochemical concentration cell O3 meter and ultraviolet absorption O3 monitor) varied from about 30 ppb by volume (ppbv) to over 350 ppbv, and the two ozone monitors agreed to within 20 ppbv. A carbon dioxide nondispersive infrared analyzer indicated modifications required for future installation, consisting of further evaluation of the zero and span characteristics of the analyzer in the aircraft environment and inflight calibration checks. (Author abstract modified)

47804 **APTIC NO. 70073**

Rehak, W. and G. Ubl

DETERMINATION OF AIRBORNE MERCURY-203. *J. Radioanal. Chem., vol. 21:453-460, 1974. 5 refs.*

A method is described for the determination of airborne compounds of mercury(2O3). The method is based on the sorption of mercury on hopcalite (activated copper/oxide manganese oxide) with subsequent monitoring for the gamma-radiation of Hg(2O3). Aerosol activity in the air is separated by sucking the air through a filter prior to the absorption tube. The sensitivity of the method permits the assessment of less than 1/10 of the maximum permissible concenuration in air. The procedure was tested experimentally; it was suitable for the determination of airborne mercuric acetate and its thermal decomposition products. (Author abstract)

47805 **APTIC NO. 70046**

Renoux, A., J. F. Butor, and G. Madelaine

USE OF ELECTRON MICROSOCOPY FOR DETERMINATION OF THE GRANULOMETRIC DISTRIBUTION OF ATMOSPHERIC AEROSOLS WITH RADII OF BETWEEN 0.0035 MICRON AND 1 MICRON. *(Determination de la repartition granulometrique, par microscopie electronique, des aerosols atmospheriques de rayons compris entre 0.0035 micron und 1 micron). Chemosphere, 3(3):119-122, 1974. 6 refs. Translated from French, 6p.*

An experimental procedure was developed permitting observation of aerosols with radii of a few 10 to the -7th cm. The equipment consists of an eight-stage Andersen cascade impactor, a nucleopore filter with 0.4-micron openings, a rotameter calibrated for air at atmospheric pressure, a Sartorius pump, and a Gallus-type gas meter calibrated for air. The seventh and eighth stages were studied by electron microscope. Preliminary samples were taken, and the samples were observed. Samples were then taken at a laboratory at Brest, France.

47806 **APTIC NO. 65209**

Richardson, Robert L.

PERFORMANCE OF AMBIENT HYDROCARBON MONITORS IN THE TEXAS CONTINUOUS MONITORING NETWORK. *Preprint, Air Pollution Control Assoc., Pitt-*

sburgh, Pa., 13p., 1974. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-56.)

The experiences from the Texas Air Control Board use of Bendix 8200 and Beckman 6800 automatic gas chromatographs in the Texas continuous monitoring network (Project Connie) for measurement of ambient levels of hydrocarbons and carbon monoxide are presented. Both the 8200 and 6800 instruments monitor carbon monoxide (CO), methane (CH4), and total hydrocarbons (THC) automatically. In the Connie program all hydrocarbon monitors are operated as similarly as possible. This unit approach is useful in standardizing the accuracy of the data and in troubleshooting instruments. Unitization is implemented through strictly scheduled maintenance, use of a Connie Operations Manual, and audits of equipment. Several characteristic problems confronting the TACB during the first year of operation with the Bendix 8200 include: 5-A mole sieve column deactivation, carbon monoxide ghost peaks, oxidative catalyst failure, and methane elution in the upset cycle. Problems with the Beckman 6800 include oxidative catalyst failure and attenuation changes. (Author abstract modified)

47807 **APTIC NO. 69791**

Rosenberg, Norman J. and Shashi B. Verma

A SYSTEM AND PROGRAM FOR MONITORING CO2 CONCENTRATION AND ELEVATION GRADIENTS IN AN AGRICULTURAL REGION. *In: Terrestrial Source and Sink Strengths for Atmospheric Carbon Dioxide in an Agricultural Region (Second Annual Report). Nebraska Univ., Lincoln, Dept. of Horticulture and Forestry, National Oceanic and Atmospheric Administration Environmental Data Service Contract 2-35385, Nebraska Agricultural Experiment Station Proj. 20-31, Regional Research Proj. 11-33, 17p., April 30, 1974. 2 refs.*

NTIS: COM-74-11304

Atmospheric carbon dioxide concentrations and gradients representative of a large agricultural region were monitored at Mead, Nebraska with infrared gas analyzers. A meteorological tower was equipped with sampling intakes at various elevations up to 16 m through which air is drawn to the laboratory for analysis. An automatic calibration system was developed to permit hourly checks of analyzer performance. Profiles of wind speed and air temperatures were also measured on a year-round basis. The equipment, calibration techniques, errors, and results associated with the measurement of the CO2 concentrations and gradients are described. The accuracy of gradient measurements were generally close to + or - 0.2 ppm, while absolute concentrations were measured with an accuracy of + or - 1-2 ppm. The system for measurement of CO2 concentrations and gradients is programmed for automatic calibration. (Author abstract modified)

47808 **APTIC NO. 69678**

Russell, Philip B., Edward E. Uthe, Francis L. Ludwig, and Neil A. Shaw

A COMPARISON OF ATMOSPHERIC STRUCTURE AS OBSERVED WITH MONOSTATIC ACOUSTIC SOUNDER AND LIDAR TECHNIQUES. *Preprint, Stanford Research Inst., Menlo Park, Calif., Atmospheric Sciences Lab. and Argonne National Lab., Ill., National Science Foundation Research Grant GI 38363 and Atomic Energy Commission Grant, 49p., 1974. 37 refs.*

A monostatic lidar and a monostatic acoustic sounder were used to observe a common atmospheric volume during several summer days in St. Louis, with the resulting signal displays being analyzed to show the relative merits of the techniques for observing boundary layer processes important to urban weather modification and air pollution. The lidar and acoustic sounder performed about equally well in defining the depth of the mixed layer during early forenoon periods when aerosols had accumulated under a radiation inversion. During strong convection periods in which thermal plumes rose far above the early forenoon mixing depth, the lidar depicted the full vertical extent of these plumes by using surface-generated aerosols as tracers, while the sounder detected only the lower regions where thermal turbulence was strong. The acoustic sounder readily depicted features of the surface- layer-reformation or subsidence regime in which neighboring air masses did not contrast optically, while the lidar did so only after a spatial discontinuity of aerosol content had developed. The acoustic sounder thus appeared to be equal or superior to the lidar in defining features that were associated with high air pollution potential; however the quantity directly observed by the lidar was aerosol pollution itself, with this information being very useful in ascertaining the mixing capability of multiple sounder-depicted layers. (Author abstract modified)

47809 **APTIC NO. 69879**

Sakabe, Hiroyuki, Katsunori Homma, and Tetsuo Ishida

A STUDY ON URBAN PARTICULATE AIR POLLUTANTS BY THIN METAL FILM METHOD. *Ind. Health (Japan), 12(1-2):73-84, June 1974. 2 refs.*

Particulates in urban air were collected on a collodion membrane and thin metal film and then observed by electron microscopy. Particulates which took a jellied or greasy appearance and evaporated after exposure to an electron beam on collodion membranes were noticed. On metal film, the appearance of jellied particles was different from that on collodion membranes because of an interaction between some components of the particles and metals. Strong corrosiveness of the jellied particles in the summer may have relationship to the irritability of air pollutants to mucous membranes. It seems probable that the jellied particles in the summer were composed of inorganic acids or their salts. (Author abstract modified)

47810 **APTIC NO. 69950**

Salooja, K. C.

SOME SERIOUS ERRORS IN SO3 DETERMINATION IN FLUE GASES. *Energy World, 1974:10-11, 1974. 8 refs.*

Sulfur trioxide monitoring in flue gases can be affected by losses of SO3 because of surface absorption in the sampling, filtering, and analytical stages. These losses were studied experimentally. The length of the long steel sampling probe, its construction material, and whether or not it was heated markedly affected the SO3 concentration recorded. The amount of silica wool in the filtering plug also affected SO3 losses. Conventional absorption cells also gave incorrect results because of losses of SO3. Losses in absorption cells could be overcome by using multi-cell systems or better-designed cells. Losses in sampling probes and filters could not be altogether avoided, but they could be minimized by minimizing the size of the probe and the amount of filter. The unavoidable loss must be determined to adjust the observed data if the data are to have any meaning.

47811 **APTIC NO. 70240**

Sato, Chikahiro, Yoshihiko Kameda, and Sadao Ueki

EXHAUST GAS ANALYZERS FOR SPECIFIC AUTOMOBILE LINES. *(Rainyo jidosha haikigasu bunseki sochi no kosatsu). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 349-359, 1974. 16 refs. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

For direct and production line measurements of carbon dioxide, carbon monoxide, and hydrocarbons in exhaust gas at idling, the exhaust gas analyzer CAREX73L was designed for new automobiles. In the CAREX73L, the complete block system is adopted, which consists of pneumatic sampling device, a nondispersive infrared (NDIR) analyzer, and a gas free calibrator. The pneumatic sampling device consists of sample probe, a crude filter (for the removal of dust and oil mist), a dehumidifier, a sampling pump (suction), a purging mechanism, and a fine filter. For the analysis, the NDIR analyzers, two- wavelength NDIR analyzer for CO, CO2 meters, and a double beam NDIR for HC are used. These NDIR analyzers are solid state and free from the effects of vibration. The measurement range of HC is 1-100 ppm in terms of n-C6H14. For the zero span adjustment, a gas free calibrator is used.

47812 **APTIC NO. 70264**

Schaefer, W.

THE APPLICATION OF SPECTROSCOPIC AND LASER METHODS FOR THE DETERMINATION OF GASEOUS AIR POLLUTANTS. *(Die Anwendung von spektroskopischen Methoden und Lasern zur Bestimmung von gasfoermigen Schadstoffen in der Luft). Text in German. PTB-Mitt., 84(2): p, 84-92, April 1974. 17 refs.*

The concentrations of the most important gaseous air pollutants are presently determined chiefly by spectroscopic methods. In addition to the nondispersive infrared analyzers which have been used for many years, dispersive instruments utilizing special modulation techniques have lately come into use, as has an optical detection method based on the chemiluminescent reaction of nitric oxide with ozone. Concentrations of trace gases in ambient air can be determined by any of these methods, by providing increased absorption path lengths, e.g. by the use of multiple reflection cells in derivative spectrometry; these cells increase the path length to 20 m, extending the sensitivity to concentrations in the 1 ppm range. Lasers serve as the source of light for these cells, especially since tunable diode lasers have become available.

47813 **APTIC NO. 70136**

Scheide, Eugene P. and John K. Taylor

A PIEZOELECTRIC SENSOR FOR MERCURY IN AIR. *Preprint, American Chemical Society, Washington, D. C., 15p. July 11, 1974. 10 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)*

A quartz piezoelectric crystal detector with gold evaporated onto the electrode as the sensor substrate was developed for the detection of small mass changes caused by the selective adsorption of mercury vapor from an air sample. Incorporation of the crystal into a variable oscillator circuit and measurement of the change in frequency of the crystal due to the increase in mass allows a highly sensitive indication of the amount of mercury present in the air sample down to the sub ppm level. Thus, the selectivity of mercury adsorption onto gold films and the sensitivity of the piezoelectric sensor are combined in this instrument. Calibration curves were obtained from ppm to sub concentrations of mercury. Reversibility was achieved by placing the sensor in an oven, by raising the temperature to 150 C, and by flow switching a stream of clean, dry air over the detector. This detector has potential use as both an air pollution sensor and in industrial hygiene applications. (Author abstract)

47814 **APTIC NO. 69200**

Schofield, Keith

PROBLEMS WITH FLAME IONIZATION DETECTORS IN AUTOMOTIVE EXHAUST HYDROCARBON MEASUREMENTS. *Environ. Sci. Technol., 8(9):826-834, Sept. 1974. 7 refs.*

Three of the major problems encountered in measuring concentration and mass emissions of hydrocarbons from engines using a flame ionization detector (FID) are discussed in detail. The magnitude of possible correlation discrepancies for analyses run on various commercial instruments as a function of operating conditions and exhaust type was estimated from measured relative molar response values. Large variations were found under certain circumstances. Results also implied that the larger analyses values occasionally observed with heated analyzers may result from increased relative molar responses to the various individual hydrocarbons rather than to decreased line absorption effects. The magnitude of the oxygen interference effect (synergism), important for real-time automotive testing, was measured on various FIDs at different conditions. A simple modification to minimize the effect is recommended for the majority of analyzers that exhibit this feature. An extensive study of instrument response times was completed for a variety of sampling lines. The relative importance of such factors as the analyzer operating temperature, sample line temperature, instrument sample pressure, bypass flow rate, sample line length, diameter, and material was established. Optimum response was realized with a heated FID using heated quarter-inch o.d. stainless steel or Teflon lines and a high bypass sample flow rate. (Author abstract)

47815 **APTIC NO. 69412**

Sehmel, G. A.

INTERSTAGE PARTICLE LOSSES IN A HIGH-VOLUME CASCADE IMPACTOR. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45- 1):1830, Environmental and Earth Sciences Rept. UC-11, p. 219-222, April 1974.*

NTIS: BNWL-1850 PT3

Commercially available 20 cfm cascade impactors were evaluated under field sampling conditions for particle sampling bias caused by interstage losses. Particles larger than respirable were deposited throughout the cascade impactor. This made it appear that the air sampled had a larger number of particles in the respirable size range than actually present. This biases the sample conservatively toward assessing the potential respirable particle hazard as greater than actual. (Author abstract modified)

47816 **APTIC NO. 69329**

Sem, G. J.

DESIGN OF THE EPA SEMI-TRAILER MOBILE AIR POLLUTION LABORATORY (FINAL REPORT). *Thermo-Systems Inc., St. Paul, Minn., Environmental Protection Agency Contract 68-02-0654, ROAP 21AKB-28, Program Element 1A1008, Rept. EPA-650/4-74-017, 55p., Sept. 1974.*

The design of a semi-trailer mobile air pollution laboratory for the Environmental Protection Agency is described in terms of basic trailer specifications, exterior trailer modifications, general interior design, air conditioning design, interior and roof layout, electrical design, lightning protection, and sampling systems for aerosols and gases. The laboratory is to be used for simultaneous measurements of many air pollutants using state-of-the-art instrumentation. Air conditioning is provided for extremes of 115 and minus 40 F. Three work benches for aerosol, gas, and data instruments are arranged as islands, allowing open aisle space and the clustering of sampling instruments for reduction of sampling losses. Sampling systems, designed to reduce sample losses under varying wind conditions, extend 10 m above ground level. Vertical sampling tubes lead to instruments sampling large particles to eliminate gravitational losses. Wind shields are provided at the sampling tube entrances. Instruments which sample particles smaller than 1 micron draw their sample from tubes clustered around a sampling manifold wall, and nuclei counters sample through short tubes from within the manifold at a point away from the boundary layer of the manifold wall. The aerosol island has two sampling systems, and the gas island has one. Gas sampling instruments are clustered around the manifold above the gas island.

47817 **APTIC NO. 65539**

Shen, Thomas T.

SELECTION OF INSTRUMENTAL METHODS FOR SO2 AND NOX SOURCE TESTING. *Preprint, Air Pollution*

Control Assoc., Pittsburgh, Pa., 19p., 1974. 8 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-188.)

Instrumental methods for sulfur dioxide and nitrogen oxides measurements from oil-fired boilers were investigated to explore the acceptability and equivalency of instrumental test methods and procedures that are compatible, accurate, and legally defendable. Under normal operating conditions without adjusting air-fuel ratio, the maximum hourly SO2 and NOx emission variations within a day from the two oil-fired boilers tested fluctuated 6% and 10% respectively. The fluctuation was non-uniform and quantitatively unpredictable as a function of time. Six representative instruments were selected for evaluation. Absorption spectrophotometry techniques (infrared and ultraviolet regions) were less advantageous for field application. These techniques require efficient small particle filtration, water removal, and sulfuric acid demisting. The electrochemical instrument demonstrated less accuracy because of calibration drift. Its advantages include simplicity, portability, immediate results, lower cost, and the multifunction of measuring SO2 and NOx simultaneously. Electrochemical, chemiluminescent, and fluorescent instruments, with appropriate sample pretreatment systems, meet the criteria for emission source testing.

47818 **APTIC NO. 69270**

Shkatov, Evgeny F., Jury P. Zhukov, and Alvin G. Kozlov

DEVICE FOR MEASURING THE RATE OF FLOW OF DUST-LADEN GASES. *(Assignee not given.) U. S. Pat. 3,803,911. 6p., April 16, 1974. 2 refs. (Appl. Sept. 18, 1972, 3 claims).*

A device for measuring flow rates of dust-laden gases is described which, unlike prior art devices which depend on pressure differences, is applicable to large ducts between 2 and 2.5 m in diameter. The primary transducer of the device consists of two hollow tubes which are provided with holes in their external surfaces intended to feed compressed air or an inert gas into the measured dust-laden gas flow. The holes in one tube are arranged coaxially with the holes in the other tube and are directed opposite to each other so that the flow of compressed air or inert gas from the holes of both tubes occurs in a direction of right angles to the direction of the measured dust-laden gas flow. Thus, the problem of primary transducer blocking by dust is eliminated. (Author abstract modified)

47819 **APTIC NO. 65190**

Smith, Franklin, Denny E. Wagoner, and A. Carl Nelson, Jr.

QUALITY ASSURANCE PROCEDURES APPLICABLE TO AMBIENT AIR MONITORING METHODS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-18.)*

The methodology used in preparing guidelines for developing quality assurance programs for the Environmental Protection Agency reference methods for measuring suspended particulates, sulfur dioxide, carbon monoxide, and photochemical oxidants in the ambient air is described. The methodology is presented using the high-volume method of measuring suspended particulates as an example. A functional analysis is given of the measurement process to identify and, if possible, characterize important error sources. Quality control techniques to aid the operator in the collection of data of good quality are described. Directions are given to aid supervisors/managers in auditing the data quality, selecting cost effective data quality strategies, and assessing data quality and data presentation. (Author abstract modified)

47820 **APTIC NO. 65538**

Soffian, Gerard and Peter R. Westlin

PARTICULATE EMISSIONS FROM APARTMENT HOUSE BOILERS AND INCINERATORS. *Preprint, Air Pollution Control Assoc., Pittsburgh Pa., 27p., 1974. 13 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-187.)*

An extensive number of tests were made using the Environmental Protection Agency s Method 5 stack sampling train to obtain emission factors for existing apartment house boilers and incinerators in the City of New York. In addition to calculating emission factors, stack emission data were examined to compare results of simultaneous emission tests and to compare the dry particulate catch of the sampling train with the total particulate catch which included the impinger catch. The data indicate that the amount of particulate captured in the impinger section of the sampling train is relatively constant and is independent of the amount of dry particulate catch found during boiler emission sampling. This possibly results from the absorption of sulfur dioxide in the impingers and the subsequent formation of relatively constant quantities of sulfuric acid. Comparison of simultaneous boiler tests indicated that the sampling train may be sensitive to variations in operating personnel, sampling conditions, and boiler operation. Tests of onsite incinerators indicate that previously published emission factors may be too high for well maintained and properly operated incinerators. (Author abstract modified)

47821 **APTIC NO. 65195**

Spirtas, Robert

STANDARDIZING COLLABORATIVE TEST RESULTS BY USE OF THE GENERAL LINEAR STATISTICAL MODEL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-27.)*

Collaborative (round robin) tests of methods for measuring ambient and source levels of air pollutants were carried out by several organizations. Results were used to evaluate each method under study and to measure the method s precision and accuracy. A proposal is made for standardizing the criteria by which collaborative test results are measured. A common format is proposed for reporting statistical summaries. Although the collaborative tests of different air sampling methods require different experimental designs, the analysis of data collected from each of them can be done by a comprehensive statistical approach known as the General Linear Model (GLM). Two examples are given. One shows the exact equivalence of GLM to the standard methodology when the experimental design is completely balanced. The second, taken from the results of an actual collaborative study, shows how GLM is clearly superior when there are missing data points. (Author abstract modified)

47822 **APTIC NO. 65203**

Spurny, Kvetoslav R., Werner Stober, Evelyn R. Ackerman, J. P. Lodge, and Kvetoslav Spurny, Jr.

A NOTE ON THE SAMPLING AND ELECTRON MICROSCOPY OF ASBESTOS AEROSOL IN AMBIENT AIR BY MEANS OF NUCLEPORE FILTERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1974. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-47.)*

Methods of sampling and classifying determination of highly dispersed fibers of asbestos aerosols in ambient air were developed using nuclepore filters rather than the membrane filter method. Data obtained by the nuclepore filter procedure indicates higher fiber concentrations in the ambient air than predicted by the membrane filter method. Disadvantages of the membrane filter method are presented, and advantages of the nuclepore method are described through laboratory experimentation. A continuing research program could lead to the development of an improved international standard method for measuring ambient concentrations of airborne asbestos. The nuclepore filter method in combination with transmission electron microscopy, scanning electron microscopy, selected area diffraction and electron microprobe analysis could make feasible the development of automated asbestos fiber sampling and analysis instrumentation.

47823 **APTIC NO. 69494**

Stein, Harvey P. and Craig D. Hollowell

MEASUREMENT OF ATMOSPHERIC SULFATE. *California Univ., Berkeley, Lawrence Berkeley Lab., 6p., 1974 (?). 20 refs.*

NTIS: LBL-2162

Methods of measuring sulfate particulate are reviewed. It is usually collected from ambinet air with high volume samplers or impactors and then alayzed by various means including electron spectroscopy for chemical analysis, optical methods based on methylthymol blue, turbidimetry, or nephelometry. All procedures other than electron spectroscopy require that the sulfate be dissolved prior to analysis, therefore only soluble sulfate is measured.

47824 **APTIC NO. 68298**

Sullivan, Frederick and Gregory Leonardos

DETERMINATION OF ODOR SOURCES FOR CONTROL. *Ann. N. Y. Acad. Sci., vol. 236:339-349, Sept. 27, 1974. 7 refs. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

Techniques for the determination of odor sources were developed. Quantitative and accurate measurements of the various emission sources and their contribution to the odor in the ambient air must be determined to identify and rank the various sources that should receive priority for control. Trained odor chemists are used to carry out odor surveys of the surrounding areas to define the odor types and intensities perceived off-site and to conduct in-plant surveys to identify all significant odor sources. A source sampling detailed laboratory odor evaluation technique is used to compare the various odor sources and to make predictions based on dispersion equations. The approach used to detect and evaluate odors is based on the Flavor Profile Methodology which is an objective approach to describe odor in terms of character notes and assign a total intensity of aroma rating. A seven point scale is used to denote odor intensity.

47825 **APTIC NO. 69222**

Takahashi, Akira

CONTROL AND MAINTENANCE OF THE ACCURACY OF THE NOX METER OF THE ABSORPTION PHOTOMETER TYPE. *(Kudo-kodo-shiki NOx-kei no seido iji no tameno kanri to maintenance ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):207-209, May 1974. 1 ref.*

In the Saltzman type NOx meter atmospheric air is led into a definite amount of the Saltzman solution at a definite flow rate. The coloration due to the absorption of nitrogen dioxide is measured at a wavelength of 540-550 nm. After the determination of NO2, the air is introduced into a potassium permanganate solution acidified with sulfuric acid in which nitric oxide is oxidized to NO2. Then the NO2 is determined as before with the aid of the Saltzman solution. The sampling tubes are made of teflon or Pyrex glass. It is necessary to keep the length of the pipes as short as possible. The length must be 5 m at the longest. The inside of the pipe must be as clean as possible, otherwise reactions and adsorption of sulfur oxides occurs on the inner surface of the tubes. The flow rate of air in the tubes should be kept at about 300 ml/min. The reagent must be reliable and pure. In the absorption measuring apparatus, care must be taken in monitoring changes of light emission from the light source, contamination of the window of the cell, and deterioration of the reagents. Calibration should be made as correctly as possible. The apparatus should be placed free from direct sunlight and vibration. It must be set horizontally. The electric power supply should be free from excessive lowering of voltage.

47826 **APTIC NO. 69211**

Takatsuka, Miwa, Norihito Miyamura, Senichiro Shirai, Shigeru Igarashi, and Takashi Ikawa

AN EXAMINATION OF THE SULFUR DIOXIDE MEASUREMENT METHOD BY LEAD DIOXIDE: COMPARISON OF THE QUALITY OF LEAD DIOXIDE AND THE TYPE OF CYLINDERS (BISQUE AND GLASS). *(Nisankaenpo ni yoru iosankabutsu sokuteiho no kento: nisankaen no hinshitsu, ento (suyaki, garasu) no hikaku). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center), no. 2:91-93, March 1974. 8 refs.*

The quality of lead dioxide was examined by comparing the products of a DSIR (?) standard and a product of another firm (I Co.) at three locations in Yokkaichi. Simultaneously, a comparison of bisque cylinders and newly manufactured glass cylinders was made. Lead dioxide was painted on bisque in the ordinary, known method. The glass cylinder was first wrapped with sanforized broad cloth stabilized with rubber band, then PbO2 was painted on it. The sulfur oxides collected on the cylinders were analyzed by the chloranil acid barium method. The qualities of two PbO2 products showed no difference. The DSIR product collected an average of 0.717 mg/day/100 sq cm, and the I Co. product, 0.710 mg/day/100 sq cm, with a correlation of 0.9788. The total average of the glass cylinder was 0.681 mg/day/100 sq cm and the bisque was 0.862 mg/day/100 sq cm. The glass measurement was 21% lower. Almost in all cases, the measurements on the glass seemed to be lower. The measurements by concentration were: for 0-0.5 mg, bisque was 0.39 mg and glass, 0.29 mg (26% lower); for 0.5-1.0 mg/ day/100 sq cm, bisque measurement was 0.65 mg and glass was 0.50 (-23%), and for more than 1 mg/day/100 sq cm, the bisque average was 1.50 and glass, 1.20 (-20%). The difference became even greater in winter time, compared to summer time, and the glass cylinder measurements were about 36% lower than the bisque measurements.

47827 **APTIC NO. 69263**

Takeuchi, Norifumi, Yoshio Nagata, Tomohiko Ishiguro, Takashi Hasegawa, and Yoshihiro Shigeta

STUDIES BY THE ODORLESS ROOM METHOD ON THE RELATIONSHIP BETWEEN THE CONCENTRATION OF METHYL DISULFIDE AND ITS INTENSITY AND THE DEGREE OF UNPLEASANTNESS. *(mushushitsuho ni yoru niryuka mechiru no nodo to kyodo oyobi fukaido to no kankei). Text in Japanese. Preprint, Japan Environmental Hygiene Center, Fukui, p. 81-83, 1974. (Presented at the Japan Environmental Hygiene Center, Conference on Environmental Health, 18th, Fukui, Japan, Oct. 3-4, 1974, Paper 5.)*

A six-member expert panel was asked to smell methyl disulfide of various concentrations (8.04 ppb to 8040 ppb) for 3 to 10 seconds. They evaluated the intensity and the degree of unpleasantness of the odor. The rankings were tabulated, and the data plotted. As the concentration of methyl disulfide was increased, the intensity and unpleasantness of the odor increased.

47828 **APTIC NO. 69205**

Takeuchi, Tsugio

THE TRENDS IN THE QUANTITATIVE DETERMINATION OF NITROGEN OXIDES IN ATMOSPHERIC POLLUTION. *(Taiki osen chisso sankabutsu bunseki-ho no doko). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(10): 1145-1148, Oct. 1974. 3 refs.*

The legal restrictions on atmospheric pollution, the specifications given by JIS on the measurement of nitrogen oxides, and recent trends in the techniques of instrumental analysis of NOx are discussed. In Aug. 1973, NOx was specified as a poisonous substance by the atmospheric pollution prevention law. Permissible concentrations in various discharged gases were given. The highest limit was set at 750 ppm for existing installations and at 480 ppm for installations to be built in the future. For the determination of NOx, 5 chemical methods and 9 continuous instrumental methods of analysis were specified by JIS. These include the phenol disulfonic acid method (PDS method) for nitric oxide and nitrogen dioxide, the Saltzman method for NO2, the infrared absorption method for NO, and the oxidation method for NO and NO2. For the absolute determination of NO and NO2, the chemical methods are reliable. In this case, elimination of the interference by coexisting substances is important. For example, in the PDS method, the presence of inorganic nitrates, nitrites, or organic nitrogen compounds cause positive errors in the determination of NOx. The presence of halogens causes negative errors. Also, the practice of the PDS method is too time consuming. Efforts are being made toward the elimination of the faults of these methods.

47829 **APTIC NO. 69301**

Tanno, Hironori

CONTINUOUS ANALYSIS OF SULFUR COMPOUNDS BY FLAME PHOTOMETRIC METHOD. *(Enkokodoho ni yoru io kagobutsu no renzoku bunseki). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(9): 2149-2154, Sept. 1974.*

The characteristics of dry methods of measuring sulfur compounds in the air are: instantaneous response; inferior sensitivity compared to that of wet methods; dependency on dynamic methods for correction of equipment and requirement for a stable gas producer for low concentration gas; all the dry methods (chemiluminescence, hydrogen flame ion, and flame photometry) require toxic or dangerous gases; the maintenance and management require extreme care; the initial costs are high; and since the air pollution standards are based on hourly figures, instant responses of the dry methods must be converted to hourly figures. The flame photometric detector was developed by the Environmental Protection Agency of the United States, and it has superior sensitivity and selectivity and does not require reaction liquid; its maintenance is simple. The operation is based on the conversion of sulfur containing compounds into sulfur molecules by hydrogen flame; hydrogen and hydroxide radicals excite sulfur molecules and emit light, which is amplified and measured. The performance tests on reliability, stability, response characteristics, and inteference show generally good results. The long term continuous test conducted by the EPA was reported as satisfactory. Carbon dioxide is known to interfere negatively by the quenching phenomenon. But since the CO2 concentration in the air is about 300 ppm and is relatively stable, the correction should be relatively simple.

47830 **APTIC NO. 69844**

Thal, M. F. and P. Zettwoog

MEASUREMENT TECHNIQUES FOR ODORIFEROUS AIR POLLUTANTS. *(Techniques de mesure de la pollution atmospherique due aux odeurs). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), (191):53-60, April 1974. 3 refs.*

Olfaction and the structure and operation of olfactory systems are reviewed with respect to the action of odorous pollutants on the human olfactory system. Very strong correlations have been established between molecular properties and smell intensity for pure substances. The variety of the responses depends upon the number of molecules absorbed by the mucus, the pollutant concentration, molecular distribution among proteins, and the rhythm of the stimulation of the neuro-sensorial mucus. Odor perception is both quantitative and qualitative. Various theories relating molecular and odor properties are presented. A light weight field olfactometer is discussed which permits dilution of odorant air in pure air in a proportion from 0 to 2500. Two methods of physico-chemical analysis of odors are described. Good equipment and well-trained personnel ensure the determination of pollution intensity and odor effects on humans.

47831 **APTIC NO. 70263**

Tokunaga, Rikio, Shogo Takahata, Mariko Onoda, Toshio Ishi-i, Kunihiko Sato, Miyoko Hayashi, and Masayuki Ikeda

EVALUATION OF THE EXPOSURE TO ORGANIC SOLVENT MIXTURE. COMPARATIVE STUDIES ON DETECTION TUBE AND GAS-LIQUID CHROMATOGRAPHIC METHODS, PERSONAL AND STATIONARY SAMPLING, AND URINARY METABOLITE DETERMINATION. *Int. Arch. Arbeitsmed., 33(4):257-267, 1974. 32 refs.*

A comparative study was conducted in a printing plant regarding various methods of measuring environmental concentrations of a solvent vapor mixture, the major components of which were n-hexane, ethyl acetate, and toluene. Introduction of a portable gas-liquid chromatograph made it possible to analyze spot-air samples at the site of the exposure, and thereby obtain immediate information on its quality and quantity. The results were compared with those from personal sampling and continuous stationary sampling coupled with gas-liquid chromatographic analysis as well as detection tube methods. Spot-air, personal, and continuous stationary sampling methods were in good parallel while the detection tube method was less valid in the case of vapor mixture exposure. Studies of toluene metabolism revealed that the biological half-life of toluene was about 7.5 hr and that the metabolism was not significantly disrupted by the co-presence of other solvents such as ethyl acetate and n-hexane. (Author abstract)

47832 **APTIC NO. 69720**

Tsuno, Kiyoshi and Naomasa Sunano

A LEAKAGE DETECTOR FOR DELETERIOUS GASES. *(Hieisei gasu nado no rosetsu kenchiki). Text in Japanese. (Shinei Industries (Japan)) Japan. Pat. Sho 49-14638. 3p., April 11, 1974. (Appl. June 6, 1970, 1 claim).*

A leakage detector using a sintered semi-conductor as a gas detector and a heat-sensitive semiconductor as an indirect heater is described. The device has the following characteristics: a detecting element which consists of 3 lead terminals and a positive thermister of heat sensitive ceramic semiconductor used as a heat releasing body; a pair of indium- antimony electrodes connected to the two outside lead terminals; an insulator on the ceramic semi-conductor and a silver electrode between the insulator and the center lead terminal; a sintered gas detecting semi-conductor which is prepared from 91-95% zinc oxide and 4-9% vanadium pentoxide, surrounding the lead terminals; a case with holes and supporting plate which supports the detecting element; a triac which is fixed on the case and connects to two of the lead terminals through gate electrodes; and a lamp or buzzer between the triac and source of electric power. The positive thermister can be heated to 250 C in 2 sec. When combustion gases leak, the electric resistance between the center and one of the outside lead terminals decreases and current passes through the gate electrodes to the lamp or buzzer.

47833 **APTIC NO. 65198**

Turner, George

SOME CONSIDERATIONS IN QUANTITATIVE DETERMINATION OF NO, NO2, AND NOX BY CHEMILUMINESCENCE ANALYZER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-32.)*

Chemiluminescence analyzers and their use at both high parts-per- million and parts-per-billion concentration levels for the quantitative measurement of oxides of nitrogen are presented. Seven possible sources of error, together with procedures for their elimination or reduction, are discussed. These include nonlinearity, inefficiency in nitrogen dioxide to nitric oxide conversion, unequal flows in NO and NOx channels, interferences (positive or negative), spurious response to NO2 in NO determination, holdup and reduction of NO2 in sampling components, and inaccurate calibration means. A new method for determining converter efficiency is described, in which an external NO2 to NO converter changes the NO/NO2 ratio in the sample. The test is readily automated and programmed by a computer. The effect of high concentrations of carbon dioxide on Nox determinations is shown, with procedures for eliminating this effect. Long term stability of cylinder gases containing NO and NO2 in nitrogen is shown, as is the stability of low-parts per million blends of NO2, in either nitrogen or air. (Author abstract modified)

47834 **APTIC NO. 69483**

Turner, George S. and R. M. Neti

DESIGN AND PERFORMANCE OF AN AMBIENT LEVEL NO/NO2/NOX MONITOR. *Preprint, Instrument Society of America, Pittsburgh, Pa., 10p., 1974. 6 refs. (Presented at the Instrument Society of America, Analytical Instrumentation Symposium, Annual, Proceedings, Pittsburgh, Pa., May 12-15, 1974.)*

A chemiluminescence detector for nitric oxide, nitrogen dioxide, and nitrogen oxides in stack gases and automotive emissions is described. The basic elements of the analyzer are shown schematically. The performance of the analyzer was checked in laboratory tests. Response to NO at the 1 ppm level was almost instantaneous. At the 10 ppm level of NO2, 2 or 3 min were required. The instrument was also tested on ambient air in the field. The calibration of the monitoring instrument using the Griess-Saltzman method was also studied.

47835 **APTIC NO. 70054**

Varmuza, K.

INTERPRETATION OF LOW-RESOLUTION MASS SPECTRA BY CLASSIFICATION WITH NEIGHBOR SPECTRA FROM A LIBRARY. DETERMINATION OF SUBSTANCE CLASSES AND CHEMICAL STRUCTURES. *(Interpretation niedrig aufgeloester Massenspektren durch Klassifikation mit Hilfe der Nachbarspektren aus einer Bibliothek. Ermittlung von Substanzklassen und chemischen Strukturen). Z. Anal. Chem., 268(5):352-356, 1974. 12 refs. Translated from German, 16p.*

The Euclidean distance between mass spectra in an n-dimensional hyperspace is a good measure of chemical-structural similarity of low molecular organic substances. The KNN-method (K-nearest neighbor classification rule), a well-known method of determining molecular structures by pattern recognition, was used to find neighbor-spectra for a library which was close to the mass spectrum of an unknown substance. These neighbors were very suitable for determining some classes of molecular structures of the unknown substance, which did not need to be a member of the library. On an average, the first neighbor had the highest classifying capability.

47836 **APTIC NO. 65541**

Weitzman, Leo and John C. Reed

REVIEW OF PARTICULATE STACK TEST REPORTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-194.)*

The principles of a properly performed particulate stack test are discussed from the viewpoint of an individual reviewing the test report. A systematic analysis method is presented which allows calculation of the isokinetic ratios, pollutant mass emission rates, and other test parameters needed to determine whether the sampling was properly performed. A second worksheet is presented which enables the reviewer to determine the reliability of the test results in relation to applicable regulations. The calculations use the raw data and can be performed in approximately 1/2 hr with a slide rule or a square root function portable calculator. For stack test data on coal fired boilers, the normal distribution is a realistic description of deviation from the measured mean of a test. (Author abstract modified)

47837 **APTIC NO. 69917**

Wolcott, Duane Kent

METHODS FOR THE DIRECT DETERMINATION OF HEAVY-METAL POLLUTANTS IN THE ENVIRONMENT. *Louisiana State Univ. and Agricultural and Mechanical Coll., Baton Rouge, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-7273, 1974, 170p. 93 refs.*

An atomic absorption spectroscopic instrument for the direct, real-time determination of heavy-metal pollutants in solid, liquid, or gaseous (atmospheric) samples is described. The instrument uses a carbon bed atomizer for the reduction of metal pollutants to free atoms and a heated quartz long path absorption tube for maintaining the atoms in the light path in a free atomic state. The tube serves to increase the optical path available for absorption, thus increasing the sensitivity of the atomic absorption technique. Determinations of cadmium in the atmosphere as well as for cadmium and lead in other matrices indicate that the use of the carbon bed atomizer largely eliminates interferences due to molecular absorption. Ambient air signals are also illustrated for sodium, potassium, arsenic, lead, selenium, copper, and zinc. The instrument must be calibrated for quantitatively determining the concentrations of pollutants in the atmosphere. (Author abstract modified)

47838 **APTIC NO. 68402**

Wortman, Jimmie, J., Robert P. Donovan, Arthur D. Brooks, Larry K. Monteith, William H. Kinard, and Robert L. O Neal

PARTICULATE AND AEROSOL DETECTOR. *Research Triangle Inst., Research Triangle Park, N. C. and National Aeronautics and Space Administration, Hampton, Va., Langley Research Center, National Aeronautics and Space Administration Case LAR-11434-1, 13p., 1974.*

NTIS: N74-22112

A device for detecting and counting micron size particles suspended in a gas is described which utilizes metal-oxide-silicon capacitor detectors as its basis for operation. The invention consists of an accelerator, a capacitor sensor, and a readout device. The accelerator directs particles into the capacitor with such force that they penetrate the capacitor causing discharges that are recorded by the readout device. The basic principle of the sensor operation is that a charged capacitor can have a discharge initiated by the impact of a high velocity particle. With suitable construction methods and under appropriate biasing and impacting conditions, the impacting particle creates a discharge path which is self-healing. Once the discharge action is complete, the low resistance path no longer exists between the two capacitor plates and the capacitor is again able to accept a charge. The density and size of particles directed into the capacitor can be determined by monitoring the voltage on the capacitor plate.

47839 **APTIC NO. 69258**

Yamasaki, Hiroshi, Kenichi Mineoka, and Manabu Tani

MEASUREMENT OF THE CONCENTRATION OF SUSPENDED PARTICULATE MATTER. *(Fuyu ryushijo busshitsu nodo so sokutei ni tsuite). Text in Japanese. Japan Environmental Hygiene Center, Fukui, p. 88-89, 1974. (Presented at the Japan Environmental Hygiene*

Center, Fukui, p. 88-89, 1974. (Presented at the Japan Environmental Hygiene Center Conference on Environmental Health, 18th, Fukui, Japan, Oct. 3-4, 1974, Paper 9.)

There are two methods of measuring atmospheric particulate concentration: weight concentration determination by direct determination of the weight concentration by trapping the particulate matter on filter paper; and relative concentration determination by determination of some other concentration which can be related to the particulate weight concentration. The environmental standards are expressed in weight concentrations, but in order to facilitate the taking of measurements, a continuous monitoring setup usually measures the relative concentrations. The transformation coefficient from the relative concentration to the weight concentration was calculated by taking weight concentration measurements with a multistage low-volume air sampler in the Tokyo Metropolitan area from September 1973 to March 1974, and correlating the results with the relative concentration measurements being taken during the same period of time.

47840 **APTIC NO. 69713**

Zephoris, M. and J. P. Meyer

AUTOMATIC APPARATUS FOR THE MEASUREMENT OF LOW SULFUR DIOXIDE CONCENTRATIONS. *(Appareil automatique de mesure des faibles concentrations en anhydride sulfureux). Text in French. Meteorolgie, no. 29:53-66, Jan.-March 1974.*

An automatic apparatus suitable for the continuous or sequential measurement of low sulfur dioxide concentrations in the air is described. The air sample to be analyzed is first treated with silver wool to remove ozone and hydrogen sulfide, after which the clean air is bubbled through a potassium iodide solution containing starch at pH 4. The degree of discoloration of the potassium iodide solution as caused by SO2 is a measure of the SO2 concentration. The degree of discoloration is measured colorimetrically, and the electric signal obtained is compared with a reference. The apparatus is suitable for the automatic determination of SO2 in a concentration range of 0-80 microgram/cu m.

47841 **APTIC NO. 69556**

Office of Air Quality Planning and Standards, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

DESIGNATION OF UNACCEPTABLE ANALYTICAL METHODS OF MEASUREMENT FOR CRITERIA POLLUTANTS. *EPA-450/4-74-005, OAQPS Guideline 1.2-0.18, 44p., Sept. 1974. 52 refs.*

The acceptability of analytical methods for measurement of criteria pollutants is designated. The pollutants are total suspended particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, photochemical oxidants (ozone), and total hydrocarbons corrected for methane. Each monitoring method is placed into one of three categories: approved-Federal Reference method (FRM) or equivalent; unapproved-not yet determined to be equivalent to the FRM; and unacceptable-known to yield measurements of poor accuracy and reliability, and in most cases obsolete. Analytical methods including different types of hi-vol gravimetry, non- dispersive infrared spectrometry, coulometry, flame ionization detectors, colorimetry, flame photometry, conductimetry, West- Gaeke, chemiluminescence, Saltzman, and bubblers are rated. Guidance on the acceptability of methods for future measurements is provided. The only officially approved methods are the FRM promulgated on April 30, 1971 with the National Ambient Air Quality Standards. (Author abstract modified)

47842 **APTIC NO. 69648**

Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center

APPENDICES. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. EPA-650/1-74-004, p. A-1, to A-32, B-1 to B-3, C-1 to C-22, D-1, E-1 to E-8, May 1974. 188 refs.*

NTIS: PB 234 920/AS

Appendices are presented on Community Health and Environmental Surveillance System (CHESS) measurement methods, precision of measurements, and quality control; National Air Sampling Network (NASN) laboratory methodology questionnaires used in the CHESS studies; abbreviations and conversion factors; and a bibliography. The CHESS measurement methods described include the West-Gaeke method for sulfur dioxide, the Jacobs-Hochheiser method for nitrogen dioxide, the hi-volume sampler for total suspended particulates, the turbidimetric method and methylthymol blue method for suspended sulfates, the hydrazine sulfate-copper sulfate and the copper-cadmium reduction method for suspended nitrates, the optical density of filtered deposit method for coefficient of haze, the cyclone separator method for fine particulates, the high-volume cascade impactor method for size distribution of fine particulates, and the dust fall determination method. Quality control, data analysis, and precision of measurement are also mentioned. The NASN methodology for suspended particulate matter, organic particulate matter, nonmetallic inorganic constituents, metals, and gases are described.

1973

47843 **APTIC NO. 67145**

Benarie, M., A. Grudzinski, and J. P. Quetier

RECENT DEVELOPMENTS CONCERNING THE PRINCIPLE OF PARTICLE DETECTORS USING MECHANICAL OBSERVATION ON THEIR IMPACTION (MICRODYNAMOMETER). *(Developpements recents concernant le principe des detecteurs de particules par observation mecanique de leur impaction (microdynamometre)). Text in French. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany 1973, p. 8-12. 10 refs. (Oct. 17-18.)*

The principle and practical design of microdynamometers for the determination of the mass of aerosol particles by measuring their impaction on a microbalance in a vacuum chamber are described. As the energy generated by a single particle impacting on the microbalance is very small, the kinetic energy of the impaction of a jet of accelerated particles is measured. The particles are accelerated to about 200 m/sec when admitted to the chamber with a vacuum of less than 1 mbar. The amplitude of the displacement of the dynamometric organ can be measured by cathetometer, or by optical, electrostatic, electromagnetic or other methods.

47844 **APTIC NO. 67063**

Birks, L. S.

APPLICATION OF X-RAY FLUORESCENCE TECHNIQUES TO AIR POLLUTION PARTICLES. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):54-55, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

X-ray fluorescence techniques are reviewed in terms of their application to the analysis of airborne particulates. Rapid economical analysis of standard air-filter samples is possible with X-ray fluorescence since no specimen preparation is required and 10-20 elements can be measured simultaneously in less than 2 min time. Detectability depends on the intensity of the characteristic lines of the elements and on the background intensity scattered by the filter substrate. Using one or two min measurements, detectable limits for elements from aluminum to vanadium generally fall in the 1-5 ng/sq cm range; transition elements from iron to zinc fall in the 10-50 ng/sq cm range; and higher atomic number elements where the

L series X-ray lines must be utilized may require 100 ng/sq cm or more. Generally, radioisotope sources are not competitive with X-ray tube excitation because even the strongest isotopes yield several orders of magnitude less emission than ordinary X-ray tubes. A comparison of energy dispersion using best-resolution solid-state detectors with wavelength dispersion using crystal spectrometers shows that either method gives similar single element detectability, though crystal spectrometers give better resolution. Background interference which limits detectability can be greatly reduced by using Millipore or similar material of low mass weight to reduce scattering by the filter substrate.

47845 **APTIC NO. 69822**

Brosset, Cyrill

PROBLEMS INVOLVED IN CHOOSING A SUITABLE METHOD OF DETERMINING HAZARDOUS ACIDITY ON PARTICLES. *Preprint, Swedish Water and Air Pollution Research Lab., Stockholm (Sweden), 10p., March 1973. 3 refs.*

A method for determining particle-borne acid is necessary because of the harmful effects that strong acid carried by respirable particles can have on human health. Current knowledge concerning the nature of different proton donors and their relationship to recipients with different pH-values is reviewed. A suitable method for determination of acid-borne particles cannot be developed until proton donors that are relevant under the circumstances are established, since the acidity in question may be due to the presence of different proton donors which act differently depending on the pH of the recipient. (Author abstract modified)

47846 **APTIC NO. 69502**

Carlton, Robert, M. L. Huebschman, and L. D. Cantrell

ANALYSIS OF NASHVILLE AIR POLLUTION II. *J. Tenn. Acad. Sci., 48(4):134-136, Oct. 1973. 2 refs.*

Studies of a Nashville air pollution sample were conducted using a two-component system. One system employing source excited X-ray fluorescence analysis was used for qualitative determinations and another, atomic absorption spectroscopy, was used to make quantitative determinations. A brief description is given of the principles involved, and results are compared with those of a previous paper dealing with Nashville air pollution. The two techniques are complimentary in that the source-excited X-ray fluorescence, while not as sensitive as atomic absorption, allows a simultaneous assay of all components of a sample, and one can thus know which light sources to use in the atomic absorption studies. Elements were detected in the sample by atomic absorption which were not detected by X-ray fluorescence. For the elements potassium, magnesium, and sodium, the fluorescence technique was insensitive due to absorption of the X-rays in a beryllium window before entering the sensitive volume of the detector. The same was true of aluminum, silicon, phosphorus, calcium, iron, copper, zinc, barium, gold, and lead which were detected by neutron activation analysis in a previous study but were not detected by X-ray fluorescence. (Author abstract modified)

47847 **APTIC NO. 67132**

Coulson, D. M., D. L. Haynes, and M. E. Balazs, and M. P. Dolder

SURVEY OF MANUAL METHODS OF MEASUREMENTS OF ASBESTOS, BERYLLIUM, LEAD, CADMIUM, SELENIUM, AND MERCURY IN STATIONARY SOURCE EMISSIONS. FINAL REPORT. *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-0310, ROAP 26AAG, SRI Proj. PYU-1374, Program Element 1HA327, Rept. EPA-650/4-74-015, 157p., Sept. 1973. 158 refs.*

NTIS: PB 234326

A literature survey and results of laboratory and field testing of manual measurement methods for stationary source emissions of asbestos, beryllium, lead, cadmium, selenium, and mercury are given. Electron microscopy is the method of choice for asbestos, while atomic absorption spectrometry is used for Be, Pb, Cd, and Hg. Selenium is measured using a spectrophotometric method. Each of the manual methods is outlined in terms of principles and applicability, range and sensitivity, interferences, accuracy, precision, stability, sample treatment, reagents and supplies, standards preparation, apparatus parameters, and calibration procedure. The basis sampling device for each method consists of a probe, filter, impingers, meter box, and vacuum pump.

47848 **APTIC NO. 69430**

Davies, J. H.

APPLICATION OF COSPEC TO ENVIRONMENTAL MONITORING IN THE MINING AND METALLURGY INDUSTRIES. *Instrum. Min. Metall. Ind., no. 1:83- 87, 1973. 6 refs.*

The COSPEC series of correlation spectrometers are remote sensing instruments that can provide information on air pollution distribution and mass flow. The mobility of the instrument makes if attractive for pollution measurements over large areas at lower costs and with a network of individual monitors. Use of an optical light source makes it possible to carry out surveys both day and night and thereby obtain absolute ground level concentrations. With the sensor mounted in a moving vehicle, air regional pollution profiling surveys can be undertaken. A mass flow survey of pollution across a selected traverse line can be undertaken when wind speed and direction are known. As a portable sensor, COSPEC can be set up in off-site locations and can be used at ground level to monitor individual industrial stacks or other pollution sources. The instrument provides simultaneous readout of both sulfur dioxide and nitrogen dioxide, and as such is used in environmental monitoring within the mining and metallurgical industry. (Author abstract)

47849 **APTIC NO. 69298**

Deguchi, Hideaki

CHEMILUMINESCENCE NO/NOX ANALYZER AND ITS APPLICATION. *(Kemirumi hoshiki NO/NOx bunsekikei to sono oyo). Text in Japanese. Preprint, Japan Society for Spectroscopy, Tokyo, p. 44-48, 1973. (Presented at the Japan Society for Spectroscopy, Spring Meeting, May 24-25, 1973.)*

Ozone can activate nitric oxide to the excited level of nitrogen dioxide. When NO2 (excited) becomes NO2 (ground), light is given off and chemiluminescence occurs. Other compounds also react with O3 to produce chemilumenescence, but by using a light filter to eliminate wavelengths below 6000 A, a good NO2 resolution can be obtained between 6000-8000 A. The advantages of chemiluminescence analysis include a high degree of resolution in the range 0-0.1 ppm to 0-100 ppm and concentration (ppb), linearity of data, and speed and ease of operation. By attaching a converter for changing NO2 to NO, analysis of NOx (NO2 + NO) becomes possible. It is necessary to have a high concentration of O3(2-3%) with respect to that of NO(1 ppm-10 ppm) at the ozone source in the apparatus. The conversion of NO2 to NO is effected by heating with NH3 to 600 C-650 C. Schematic diagrams are included of the two types of chemiluminescence analyzers--reduced pressure and atmospheric pressure. Chemiluminescence can be used for analyzing automobile and chimney exhaust gases, and atmospheric pollution.

47850 **APTIC NO. 67069**

Dennison, J. Eugene, Robert E. Visco, and Barret Broyde

AIR ANALYSIS: RECENT INSTRUMENTATION STUDIES AND SURVEY EXPERIENCE. *West. Elec. Eng., 17(2):3-12, April 1973. 22 refs.*

Federal, state, and local agencies are requiring information on the concentrations of potential pollutants in and around industrial sites. Along with other manufacturers, Western Electric must be able to measure concentration levels of some materials accurately and systematically. Instruments have been selected when available, and developed when necessary, to make these measurements. Air surveys using these instruments, conducted at Western Electric manufacturing and service locations, have provided information on the value of instrumental air analyses and data on the air quality at company locations. The air surveys have also developed procedures for obtaining future, more comprehensive measurements. The regulations, measurement technology, monitoring methods for various pollutants (sulfur oxides, nitrogen oxides, oxidants, hydrocarbons, carbon monoxide, particulates, chlorinated hydrocarbons, acid gases and mists, and phosphorus and boron gases), and survey experience at Western Electric are reviewed.

47851 **APTIC NO. 67148**

Deworm, J. P., G. Fieuw, A. R. Sundararajan, and S. Berckmans

USE OF A CASCADE CENTRIPETER FOR RESPIRATORY HAZARD EVALUATION. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973. p. 30-34. 37 refs. (Oct. 17-18.)*

The cascade centripeter was used to measure particle size distribution of plutonium particles in an evaluation of respiratory hazards. The degree of aerosol deposition in different regions of the respiratory tract is governed by the size spectrum of the aerosols and their associated aerodynamic behavior. The aerodynamic quality of a dust governs the amount and sites of deposition and indirectly the clearance rate. The evaluation of the inhalation hazards are initiated by calculating the deposition pattern for any given aerosol, which relates deposition in the respiratory tract to the aerodynamic size distribution parameters. The cascade centripeter separates particles according to their aerodynamic properties. Methylene blue aerosols from a spinning disc generator were used to evaluate the performance of the sampler. The P4 samples were subsequently analyzed by autoradiographic methods which indicated attachment of small P4 particles to bigger inactive dust particles. (Author abstract modified)

47852 **APTIC NO. 69312**

Fairchild, Charles I., Harry J. Ettinger, George A. Carson, Donald J. Gettemy, Marvin I. Tillery, and Bruce Almich

THE STANDARD INSTRUMENT CALIBRATION AEROSOL TEST SYSTEM. *National Inst. for Occupational Safety and Health, Cincinnati, Ohio, Particulate Air Sampling Section and California Univ., N. Mex., Los Alamos Scientific Lab., NIOSH Proj. R-072, 18p., Sept. 1973. 2 refs.*

NTIS: LA-5405-MS

A system for testing personal respirable samplers in a well-characterized coal dust environment is described. Components of the system, contained in one cabinet, include a Wright Dust Feed mechanism, tritide charge neutralizer, aerosol chamber, electrostatic precipitator sampler, and a GCA Respirable Dust Monitor, in addition to air flow plumbing and controls. Employment of this test system to evaluate the performance of personal respirable particulate air sampling instruments required variations in aerosol mass concentration with respect to time and space to be less than + or - 10%. Up to four personal respirable dust samples can be simultaneously operated within the coal dust cloud. More than 80 tests of three or four samplers each showed that variation of total or respirable mass concentration is + or - 5% within the aerosol or chamber. Aerosol aerodynamic size distribution measured with Andersen cascade impactors showed the dust cloud size to be stable within + or - 6% throughout periods of operation up to 8 hr. (Author abstract)

47853 **APTIC NO. 69989**

Funkhouser, John T., Edward T. Peters, Philip L. Levins, Arnold Doyle, Paul Giever, and John McCoy

MANUAL METHODS FOR SAMPLING AND ANALYSIS OF PARTICULATE EMISSIONS FROM MUNICIPAL INCINERATORS (FINAL REPORT). *Little (Arthur D.), Inc., Cambridge, Mass., Environmental Protection Agency Contract EHSD 71-27, Program Element 1AA010, Rept. EPA-650/2-73-023, 287p., Sept. 1973. 83 refs.*

NTIS: PB 238 476/AS

Manual methods for the sampling and analysis of particulate emissions from municipal incinerators were evaluated. Particulates consist of chloride, sulfate, nitrate, and cations such as zinc, lead, tin, iron, potassium, sodium, titanium, and aluminum. An information base was prepared which describes incineration processes and sampling methodology and procedures. The technology necessary to meet the program objectives was defined. Field tests were conducted using the EPA sampling train to evaluate the plan. The train caught more than 80% of the particulate catch in the probe/cyclone and filter. Very little of the material caught in the impingers was related to what is considered particulate. The impinger catch is essentially mineral acid. It is not clear whether the oxidation of sulfur dioxide in the sampling train is a potential source of error in the impinger catch.

47854 **APTIC NO. 70176**

Gallagher, James J.

TUNABLE LASER SOURCE TECHNIQUES APPLIED TO THE ULTRAVIOLET SPECTRA OF NITROGEN OXIDES (FINAL REPORT). *Dept. of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Boulder, Colo., 14p., Aug. 23, 1973. 22 refs.*

Investigations were performed on techniques for the generation of tunable ultraviolet radiation for fluorescent spectroscopy of nitrogen oxide molecules. Dye lasers and the improvement of their power output were studied. Harmonic generation and nonlinear optical mixing schemes were considered. Amplification of the dye laser output and construction of various flashlamp configurations were studied. The features of nitrogen oxide spectra important to fluorescence observations are outlined. Applications to the spectroscopy of molecules, free radical studies, photochemical processes, ultraviolet chemical laser development, and remote sensing will all profit from the availability of tunable coherent sources.

47855 **APTIC NO. 67150**

Gebhart, J. and C. Roth

PARTICLE SIZING BY MEANS OF SMALL ANGLE SCATTERING IN THE LIGHT BEAM OF A MERCURY LAMP. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 41-44. 39 refs. (Oct. 17-18.)*

The development of optical size spectrometers for the measurement of particles above 1 micron is discussed. The resolution power of the instruments can be improved so that particles differing only a few percent in size can be distinguished. The main elements of a high resolution instrument are a suitable calibration curve and the aerodynamic focusing of the aerosol flow, the latter of which leads to constant flow velocities and homogeneous illumination of the particles in the sensing volume. Two instruments are needed to cover the size range between 0.5 to 5 micron. For particles smaller than 0.15 micron a laser of 1 Watt output is needed. Below the wavelength the calibration curve is monotonically increasing at any scattering angle. A mean scattering angle of 30-40 degrees should be used to eliminate the stray light. Above the wavelength the detection of particles is no longer a question of the scattered light intensity and of the stray light background. The scattering angle and the receiver aperture can be selected so that a suitable calibration curve is obtained and the influence of the particle material on the response is minimized.

47856 APTIC NO. 69397

Gille, John C., James M. Russell, III, Paul L. Bailey,
Frederick B. House

MEASUREMENT OF TRACE STRATOSPHERIC GASES BY INVERTING THERMAL INFRARED LIMB RADIANCE PROFILES. *Preprint, 8p., 1973. 9 refs. (Presented at the Technical Conference on Observations and Measurements of Atmospheric Pollution, Helsinki, Finland, July 30- Aug. 4, 1973.)*

An infrared technique for the remote measurement of minor constituents in the upper troposphere, stratosphere, and lower mesosphere is described. It can be used to obtain measurements of as many upper atmospheric gases as possible to develop a baseline against which to compare future changes. The infrared radiometer was studied by inverting synthesized realistic data. A satellite-borne limb scanner with presently available instrument capabilities will be able to map most of the important stratospheric and mesopheric trace gases and temperature in four dimensions. The possibility of using a series of these to monitor long-term changes should be considered.

47857 APTIC NO. 67147

Guichard, J. C., and C. Chauvelier

NEW METHOD FOR THE CONTINUOUS MEASUREMENT OF DUST CONCENTRATIONS. *(Nouveau procede de mesure en continu de la concentration en poussieres de particules solides). Text in French. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 20-29. 4 refs. (Oct. 17-18.)*

A new Jetimeter instrument for the determination of high concentrations of solid, dry particles in hot industrial waste gases based on the principle of triboelectricity is described. The dust-laden hot gas to be analyzed is sucked through a lower Faraday cage (spouted bed) with hemispheric bottom containing bronze balls 315-400 micron in diameter and with a jet inlet in its bottom center, and subsequently through a series-connected top stage containing a bed of zinc granules 400-500 micron in diameter. The top stage, serving for the determination of the triboelectric charge entrained by the dust particles from the Faraday cage, is electrically insulated from the latter. The weight concentration of the dust is a linear function of the potential measured. The Jetimeter is suitable for use up to 300 C temperature and for dust concentrations of up to 200 mg/cu m.

47858 APTIC NO. 69885

Hamil, Henry F.

LABORATORY AND FIELD EVALUATIONS OF EPA METHODS 2, 6, AND 7. *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0626, Task Order 1, Change Order 1, ROAP 26AAG, Program Element 1HA327, SWRI Proj. 01-3462-001, Rept. EPA-650/4-74-039, 63p., Oct. 1973. 1 ref.*

NTIS: PB 238267/AS

Laboratory and field evaluations (fossil fuel-fired steam plants) were made of Methods 2, 6, and 7, proposed by the Environmental Protection Agency for the determination of stack gas velocity and volumetric flow rate, sulfur dioxide emissions, and nitrogen oxide emissions, respectively. A statistical analysis of stack gas velocity data indicates that Method 2 provides an accurate estimate of the true stack gas velocity at high gas velocities. The accuracy of Method 2 velocity estimates at low stack gas velocities is unreliable. The variation in stack gas velocity and volumetric flow rate estimates appears to be principally due to variation in the determination of the velocity head in the stack. Investigations concerning the possible cause of variation in collection efficiency of SO2 in Method 6 indicate that stack gas SO2 concentration is the only factor having any significant effect on collection efficiency. The purge period specified in Method 6 is necessary to avoid apparently low SO2 values due to retention in the isopropanol bubbler. The minimum detectable limit is estimated to be 3 ppm. Investigation of possible interference with NOx determination by chloride ion indicates that the degree of interference is linearly related to chloride ion concentration. The minimum detectable limit for Method 7 is an estimated 2 ppm NOx as nitrogen dioxide. The upper limit without dilution is approximately 100 ppm NOx as NO2. The maximum sensitivity of Method 7 is somewhere between 0.2 and 2.0 ppm NOx as NO2. (Author abstract modified)

47859 APTIC NO. 70125

Hamil, Henry F. and D. E. Camann

COLLABORATIVE STUDY OF METHOD FOR THE DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES (FOSSIL-FUELED FIRED STEAM GENERATORS). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0623, ROAP 26AAG, Program Element 1HA327, SwRI Proj. 01-3487-001, Rept. EPA-650/4-74-024, 65p., Dec. 10, 1973. 14 refs.*

NTIS: PB 238293/AS

Results from collaborative studies of Method 6, promulgated by the Environmental Protection Agency for determining the concentration of sulfur dioxide emissions from stationary sources, are presented. Method 6 specifies the extraction of a gas sample from the stack, the separation of sulfur dioxide from acid mist including sulfur trioxide, and the measurement of the sulfur dioxide fraction as sulfate by the barium-thorin titration method. Collaborative tests were conducted at both a coal-fired steam generating power plant and an oil-fired pilot plant by four collaborative teams. Method 6 was accurate for SO2 concentrations below 300 times 10 to the minus 7 lbs/standard cu ft; above concentrations of 500 times 10 to the minus 7 lbs/standard cu ft, the method acquired a significant 5-10% negative bias below the true concentration. The estimated within-laboratory and laboratory bias standard deviations of the method were 4.0 and 4.2%, respectively, of a determination value. The repeatability standard deviation of a test result was an estimated 1.6% of its value, and the estimated reproducibility standard deviation of a test result was 4.5% of its value. The minimum detectable limit (conservative estimate) of the method was 2.1 times 10 to the minus 7 lbs/standard cu ft. About 75% of the reproducibility variation in a test result resided in the field sampling phase of Method 6, with the other 25% occurring in the analytical phase. Only 13% of the reproducibility variance was caused by repeatability sources, while the remaining 85% resulted from laboratory bias sources. (Author abstract modified)

47860 APTIC NO. 70126

Hamil, H. F. and D. E. Camann

COLLABORATIVE STUDY OF METHOD FOR THE DETERMINATION OF NITROGEN OXIDE EMISSIONS FROM STATIONARY SOURCES (FOSSIL FUEL-FIRED STEAM GENERATORS). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0623, ROAP 26AAG, Program Element 1HA327, Rept. EPA-650/4-74-025, 101p., Oct. 5, 1973. 6 refs.*

NTIS: PB 238555/AS

Results from collaborative studies of Method 7, the Environmental Protection Agency's proposed method for determining nitrogen oxide emissions from stationary sources, are presented. Method 7 specifies the collection of a grab sample in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution followed by the colorimetric measurement of nitrogen oxides (except nitrous oxide) with a phenoldisulfonic acid procedure. Collaborative tests were conducted at both a coal-fired steam generating power plant and an oil-fired pilot plant by four collaborative teams. The estimated repeatability standard deviation of a test result was 1.893% of the test result value. The estimated reproducibility standard deviation of a test result was 7.110% of its value. The accuracy of Method 7 was not demonstrated because of chemically significant distortions inherent in the gas cylinder accuracy test employed. The estimated minimum detectable limit of the method was 5.14 times 10 to the minus 7 lbs/standard cu ft. Nearly all of the reproducibility variation in a test result (93%) was attributable laboratory bias, with the other 7% being due to repeatability variation. Most of the apparent laboratory bias variation was caused by dubious daily spectrophotometer recalibration procedures. Restriction of the spectrophotometer absorbance calibration range to its more accurate upper region can halve the analytical procedure's percentage error contribution to the reproducibility variation.

47861 **APTIC NO. 69322**

Harrison, Paul R.

CONSIDERATIONS FOR THE DESIGN AND OPERATION OF MONITORING NETWORKS IN METROPOLITAN AREAS. *Preprint, World Health Organization, Geneva (Switzerland), and World Meteorological Organization, Geneva (Switzerland), 10p., 1973. 4 refs. (Presented at the Technical Conference on the Observation and Measurement of Atmospheric Pollution, Helsinki, Finland, July 3-Aug. 4, 1973.)*

The two major considerations for air quality instrument siting are the security of the instrument and/or sample and the purpose of the sample. The purpose may be long-term historical, short-term health protection, or source-oriented. Instrument selection depends on the type of pollutant to be measured, the frequency of calibration, reagents, electrical consideration, the sophistication of the instrumentation, the purpose of the measurements, the sensitivity and threshold of detection, and whether the system measures physical or indicative phenomenon. The two major types of networks are manual or automatic stations. The advice of an air pollution meteorologist and a multi-disciplined team effort are mandatory for success.

47862 **APTIC NO. 67160**

Hauck, H. and K. Holzer

ELEMENT-SPECIFIC EVALUATION OF CASCADE IMPACTOR AND CENTRIFUGE SAMPLES BY ATOMIC ABSORPTION SPECTROMETRY. *(Elementspezifische Auswertung von Kaskadimpaktor- und Zentrifugenproben mittels Atomabsorptionsspektrometrie). Text in German. Gessellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 86-88. 1 ref. (Oct. 17-18.)*

A method for the determination of individual elements in aerosol samples taken by means of cascade impactor and centrifuge by atomic absorption spectrometry is described. The aerosol sample captured is placed in a graphite tube which is then heated electrically to atomize the sample. Monochromatic light from a hollow-cathode lamp is sent through the graphite tube in an axial direction for measurement by means of a light-sensitive detector. Elements whose emission line is emitted by the hollow-cathode lamp absorb this line whereby an absorption signal is obtained. The graphite tube is also suitable for the analysis of originally liquid samples. Direct incineration and analysis in the graphite tube is only possible when thermal incineration is impossible, and when there are no interfering matrix effects. The sensitivity of the atomic absorption spectrometry amounts to 1-100 picogram. Lead, manganese, beryllium, nickel, and cobalt were analyzed by this method in aerosol samples.

47863 **APTIC NO. 67058**

Hinkley, E. D. and A. R. Calawa

POLLUTANT MONITORING WITH SEMICONDUCTOR DIODE LASERS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):19-22, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

A review is presented on pollutant monitoring applications of semiconductor diode lasers. Diode lasers are available with wavelengths matching strongly-absorbing infrared regions of such gases as carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, ozone, ammonia, and ethylene, as well as water vapor. The ability of the lasers to be tuned alternately on and off a pollutant gas absorption line permits diode lasers to minimize some of the problems encountered with other optical monitoring techniques. Basic types of measurements well suited to tunable laser techniques include: resonance absorption, differential absorption and scattering, resonance fluorescence, and remote heterodyne detection. Examples are given for point sampling of SO2, C2H4, and NO, in situ source monitoring of C2H4, and ambient air monitoring of C2H4. The greatest obstacle to wider application of semiconductor diode lasers is their requirement for cryogenic cooling.

47864 **APTIC NO. 67086**

Hinkley, E. D. and A. R. Calawa

DIODE LASERS FOR POLLUTANT MONITORING. *Preprint, American Chemical Society, Washington, D. C., 27p., Oct. 23, 1973. 6 refs. (Presented at the American Chemical Society, National Meeting, 165th, Dallas, Tex., April 1973.)*

Because of their small size, ruggedness, and simplicity of operation, semiconductor diode lasers have been considered for a wide variety of gaseous detection applications, from point sampling to ambient air quality measurements. Diode lasers from various compositions of semiconductor materials emitting in the 4-12 micron region of the infrared have been used to measure characteristic absorption of gases such as carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, oxygen, ammonia, ethylene, and formaldehyde. The application of diode lasers to ambient air and source monitoring by infrared absorption and examples from experiments which have been performed are described. Some of the engineering obstacles which must be overcome before the use of these devices can become widespread are discussed. Experimental results are presented for detection of ethylene across a parking lot, ethylene detection in automobile exhaust, and sulfur dioxide detection in a coal-burning power plant stack.

47865 **APTIC NO. 67094**

Hinkley, E. D.

DETECTION OF AIR POLLUTANTS WITH TUNABLE LASERS. *Proc. Eur. Elec.-Op. Mkts. Technol. Conf., 1st, Geneva, Switzerland, 1972, p. 24-33, 1973. 28 refs. (Sept. 13-15.)*

A number of tunable infrared lasers and techniques using them for the detection and monitoring of gaseous air pollutants are described. Recent progress in the development of lasers that can be matched to characteristic infrared absorption or emission lines of certain pollutants suggests wide potential application for sensitive, specific monitoring. Examples are given for highly specific point sampling, in situ source monitoring, ambient air monitoring, resonance fluorescence, and remote heterodyne detection. The tunable lasers discussed and their approximate range of coverage include: organic dye lasers (0.34-1.2 micron), parametric oscillators (0.5-3.75 micron), semiconductor diode lasers (0.63-34), spin-flip Raman lasers (53-6.2 (carbon monoxide) and 9.2-14 (carbon dioxide)), bulk semiconductor lasers (optically pumped) (0.32-34), and high-pressure gas lasers (electron-beam pumped) (4.8-8.5 (CO) and 9.1-11.3(CO2)). (Author abstract modified)

47866 **APTIC NO. 69668**

Jesenak, V., Magdi M. Naoum, and J. Tolgyessy

RADIO-RELEASE DETERMINATION OF HYDROGEN FLUORIDE IN AIR USING RADIOACTIVE KRYPTONATE OF SILICA. *Radiochem. Radioanal. Lett. 13(3):199-205, 1973. 6 refs.*

Radioactive kryptonate of silica is suggested for the determination of hydrogen fluoride concentration in air. Kryptonated discs of silica were allowed to react with different concentrations of HF in air. The results were linear within the 2-10 ppm concentration range, and were in fair agreement with theoretical assumptions. (Author abstract)

47867 **APTIC NO. 69526**

Kaaijk, J.

DETERMINATION OF FLUORIDES IN THE ATMOSPHERE (FINAL REPORT). *(De bepaling van fluoriden in de atmosfeer (eindrapport)). Text in Dutch. TNO, Haag (Netherlands), Chemisch Lab., Rept. 1973-22, 22p., Nov. 1973. 3 refs.*

NTIS: N74-25656

The further development and the resulting prototype of an automatic fluoride analyzer for continuous monitoring of atmospheric fluorides are described. It was possible to reduce the water loss due to evaporation during sampling by cooling the air to be released by means of Peltier coolers. For the measurement of the gaseous fluoride concentrations, particulate fluorides with aerodynamic diameters over 1 micron are separated by means of a miniature cyclone at an efficiency of 98%. The results of atmospheric fluoride measurements carried out with the automatic analyzer were in good agreement with those obtained by means of impregnated filters. Factors influencing the calibration curves, such as temperature and time, were studied.

47868 **APTIC NO. 69443**

Lengelle, G. and G. Verdier

GAS SAMPLING AND ANALYSIS IN COMBUSTION PHENOMENA. *Office National de Etudes et de Recherches Aerospatiales, Chatillon- sous-Bagneux (France), North Atlantic Treaty Organization Advisory Group for Aerospace Research and Development Rept. AGARD-AG-168, 190p., July 1973. 164 refs.*

NTIS: AD-766 913

Gas sampling and analysis techniques applicable to combustion systems are described. The principle methods of analysis and their analytical applicationns include: gas phase chromatography for hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide, water, methane, or any gaseous hydrocarbon; specific paramagnetism for O2, nitric oxide, nitrogen dioxide; mass spectrometry for all gases; overall or spectral for CO, CO2, CH4, water, sulfur dioxide, sulfur trioxide, NO2, chlorine, ozone, NO, benzene; nuclear magnetic resonance for hydrocarbons and organic molecules; electron spin for free radicals; colorimetry for NO2, SO2, and hydrogen sulfide; volumetry and gravimetry for various applications; electrical conductivity for SO2; combustion for H2, CO, and hydrocarbons; and coulometry; gaseous density, speed of light, speed of sound, and thermal conductivity for various applications; chemiluminescence for NO and free radicals; and raman diffusion emission spectrometry for in-situ radicals.

47869 **APTIC NO. 67061**

McClenny, W. A., W. F. Herget, and R. K. Stevens

A COMPARATIVE REVIEW OF LONG PATH ABSORPTION METHODS FOR AMBIENT AIR POLLUTANTS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):41-50, 1973. 10 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Long path absorption methods are comparatively reviewed in relation to their value for monitoring ambient air pollutants. Scanning spectrometers with continuum light sources and telescopic optics are used to gather data on various pollution sources and to select optimum wavelength regions for the analysis of specific pollutants. A Fourier-Transform Spectrometer is also available and provides spectra at much faster rates and with higher spectral resolution than grating spectrometers of similar cost. The FTS data are obtained in a form suitable for immediate computer analysis, though the computer programs and fundamental spectroscopic data required for real time read-out of concentrations of a wide variety of pollutants do not presently exist. The cost of such a multipollutant system may be prohibitive when compared with some of the less versatile but simpler laser and nondispersive infrared techniques. The Barringer Correlation Spectrometer, which modulates the spectra at the focal plane of a fixed grating monochromator with a correlation mask to produce a signal proportional to concentration, is available for measuring nitrogen dioxide and sulfur dioxide concentrations over long paths. Two types of laser systems receiving attention for long path absorption applications are a carbon dioxide laser and a tunable diode laser. The former has the drawback of large size, while the latter requires that the diodes and detectors be cryogenically cooled. A nondispersive infrared long path system is to be evaluated in the future.

47870 **APTIC NO. 70124**

McCoy, Richard A., David E. Camann, and Herbert C. McKee

COLLABORATIVE STUDY OF REFERENCE METHOD FOR DETERMINATION OF SULFUR DIOXIDE IN THE ATMOSPHERE (PARAROSANILINE METHOD) (24-HOUR SAMPLING). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract CPA-70-40, Program Element 1HA327, SwRI Proj. 01-2811, Rept. EPA-650/4-74-027, 100p., Dec. 1973. 4 refs.*

NTIS: PB 239 731/AS

Results of a collaborative study of the colorimetric pararosaniline reference method which is to be used in connection with Federal ambient air quality standards for sulfur dioxide are presented. Synthetic SO2 atmospheres generated from calibrated permeation tubes were sampled by four collaborating laboratories over a 24-hour period. Replication error varied linearly with concentration, ranging from 2.5 micrograms/cu m at SO2 concentrations of 100 micrograms/cu m to 7.0 micrograms/cu m at SO2 levels of 400 micrograms/cu m. The repeatability (day-to-day variations within an individual laboratory) varied linearly 18.1-50.9 micrograms/cu m for SO2 concentrations of 100 and 400 micrograms/cu m, respectively. The reproductibility (day-to- day variability between two or more laboratories) varied linearly with concentration from a low of 36.9 micrograms/cu m at 100 micrograms/cu m to a high of 103.5 micrograms/cu m at 400 micrograms/cu m. Comparison of the 24-hour sampling periods with 30-minute samplings run previously indicates that the former sampling method has better within- and between-laboratory precision. The 24-hour sampling method does, however, have a concentration dependent bias which becomes significant at the 95% confidence level at high concentrations of SO2. Observed values tend to be lower than the expected SO2 concentration level. (Author summary modified)

47871 **APTIC NO. 69932**

Menzies, Robert T.

FLUORESCENCE DETECTOR FOR MONITORING ATMOSPHERIC POLLUTANTS. *National Aeronautics and Space Administration Contract NAS7-100, NASA-CASE-NPO-13231-1, 13p., Dec. 27, 1973. (Also: U. S. Pat. Appl. 428,993.)*

NTIS: N74-25932

A method and apparatus for gas molecule detection is described. It can be used to detect pollutants in the air, exhausts, or stack smoke. A laser source excites the atmospheric area which contains the pollutants to be analyzed. The laser beam causes the pollutants to fluoresce and emit a return signal to the detector. The detector includes a gas cell that contains a compartment filled with the pollutant to be studied. This compartment absorbs the fluorescence from the reflected pollutant signal received at the detector. The fluorescence of the reflected pollutant signal passes unimpeded through another compartment in the gas cell. A difference-measuring circuit detects the difference in output signals from the two compartments to obtain a signal indicative of the magnitude of the pollutant being analyzed. The novelty of the invention resides in the employment of a laser to excite pollutant gases to fluoresce. (Author abstract modified)

47872 **APTIC NO. 67153**

Moenig, F. J. N. Schwarzer, and W. Stoeber

DETERMINATION OF THE AEROSOL MASS DISTRIBUTION IN AN AEROSOL CENTRIFUGE BY MEANS OF OSCILLATOR CRYSTALS. *(Bestimmung der Aerosol-Massenverteilung in einer Aerosol-Zentrifuge mit Hilfe von Schwingquartzen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 58-61. 8 refs. (Oct. 17-18.)*

Laboratory experiments concerning the determination of the mass distribution of a fluorescein aerosol by a combination of Stoeber s centrifuge at 3000 rpm and oscillator quartz crystals for layer weighing is described. The quartz crystals were placed on a strip of copper-laminated paper on the rotor cover. A Pierce- Colpitts circuit was used for the oscillator to avoid reaction with the crystals. The frequency increased with the thickness of the aerosol deposit as a function of time. The error of the microbalance method was 2.3%.

47873 **APTIC NO. 69260**

Muramatsu, Fumio

ANALYSIS OF HEAVY METALS IN SUSPENDED PARTICULATES BY X-RAY FLUORESCENCE. *(Keiko-X sen ni yoru fuyu junjinchu no jukinzoku no bunseki). Text in Japanese. Preprint, Japan Society for Spectroscopy, Tokyo, p. 19-23, 1973. (Presented at the Japan Society for Spectroscopy, Spring Meeting, May 24-25, 1973.)*

X-ray fluorescence was a suitable tool of analysis for heavy metals in atmospheric airborne particulates. The author presents an automated set-up for taking air samples and analyzing them by means of X-ray fluorescence. In using the high-volume air sampler, care must be taken to check the filter material for its heavy metal content, which can vary by manufacturer and lot. It is necessary to make up calibration material containing the elements to be analyzed in amounts of the same order of magnitude as that of the actual samples. The advantages of X-ray fluorescence analysis are speed, accuracy, ease of operation, and minimal loss of the sample material.

47874 **APTIC NO. 69342**

O Connor, D. T.

CALIBRATION OF A MONSANTO CASCADE IMPACTOR WITH A MONODISPERSE AEROSOL. *National Radiological Protection Board, Harwell (England), 32p., Aug. 1973. 9 refs.*

NTIS: NRPB-12

Thy performance of a size selective air sampler, the Monsanto cascade impactor, modified for use as an instrument for sizing solid airborne particles in radon monitoring of mines was studied using monodisperse unit density spheres of methylene blue dye. Both two-stage and three-stage arrangements of the impactor were studied. Wall losses in the three-stage design were so high as to make its use in the field unsatisfactory. Improvements in the two-stage configuration were made by arranging for vertical in-line entry of air into the instrument. The use of a wire gauge filter of appropriate dimensions eliminated errors in interpretation resulting from the deposition of aerosols containing free atoms of solid elements on the collection cup. The two-stage instruments are performing satisfactorily in sizing radon daughter aerosols in mines. The monodisperse aerosol- colorimetric assessment technique for determining particle deposition is a more elegant approach than the use of polydisperse aerosols with subsequent counting and sizing of particles under an optical microscope.

47875 **APTIC NO. 69364**

Parker, Colin, Clive Parker, and John Sanders

THE DETERMINATION OF METALS IN AIR BY FLAMELESS AAS. *Preprint, 15p., 1973.*

An atomic absorption spectrometric technique to determine metals in air particulates using a carbon rod atomizer is described. The carbon rod atomizer consists of a power supply, a gas control unit, and a workhead. The measurement technique was tested on samples of particulates collected by high-volume sampling in Melbourne, Australia. Concentrations of copper, lead, iron, nickel, and cadmium were determined. With the combination of high-volume and low-volume techniques, nonflame atomic absorption atomizers offer great potential in the field of air particulate analysis.

47876 **APTIC NO. 75041**

Poe

DUST SEPARATION – IMPORTANT ELEMENT OF ENVIRONMENTAL PROTECTION. *(Entstaubung -- wichtiges element des umweltschutzes). Wasser Luft Betrieb, 17(10):355-358, 1973. Translated from German, 12p.*

Monitoring and control of dust in work areas are discussed. An environmental information system that encompasses measuring and process technology, transmission systems, data processing, and generating proposals for air resource management at all administrative levels is described. Commercially available monitoring equipment for carbon monoxide which combine measurement, alarm, and control units in portable, automatic, and continuously operating form are described. Analytical methods used are infrared spectrometry, catalytic oxidation, and thermoelectricity. Dusts can be monitored with membrane filters which simulate human inhalation. Various types of air conditioning equipment which can be used to remove dust by electrostatic filtration, and odors by oxidation are described. The impurities removed from inside air cannot be returned to the atmosphere. The identity and quantity of pollutants in exhaust gases can be discovered with the use of smokemeters or photometric detectors.

47877 **APTIC NO. 67060**

Richards, L. Willard

A NEW TECHNIQUE TO MEASURE SULFURIC ACID IN THE AIR. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):40-40a, 1973. 1 ref. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

A technique is described for the measurement of sulfuric acid in air. Ambient air is drawn through a filter in a first step to collect the aerosol particles and hence the H2SO4, while in a second step the H2SO4 is volatilized by warm dry air. The amount of acid volatilized is measured with a flame photometric detector. The H2SO4 collected in one cycle of the monitoring system is volatilized in the following cycle so that a continuous record of the average concentration is obtained. The monitoring method detects only sulfur containing compounds which are in the particulate phase under ambient conditions and which vaporize when dried and warmed; hence, interferences are not expected to be a problem.

47878 **APTIC NO. 67149**

Roth, G. and J. Gebhart

COMMENTS TO THE LOWER DETECTION OF A LASER AEROSOL SPECTROMETER. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 36-40. 38 refs. (Oct. 17-18.)*

The measurement of aerosols with a laser aerosol spectrometer and the determination of its lower detection are discussed. Instruments using the light scattered by a single particle are advantageous because the analysis of a highly concentrated aerosol of airborne particles is possible. If a spectrometer is designed for high resolution power or the measurement of highly concentrated aerosols, for independence of the response of the particle material or for a very low detection limit, a general arrangement is no longer feasible. False light and the scattering of the molecules inside the total scattering volume produce noise at the photomultiplier output. This noise may determine the lower detection limit of the instrument. To determine the present false light and molecule scattering in the instrument two different experiments were conducted. The calibration curve of an argon laser spectrometer shows the lower detection limit of the instrument can be placed to a particle size of 0.05 micron.

47879 **APTIC NO. 67159**

Spurny, Kvetoslaw R.

KINETICS OF THE CLOGGING OF NUCLEPORE FILTERS. *(Zur Kinetik der Verstopfung bei Kernporenfiltern). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 81-85. 12 refs. (Oct. 17-18.)*

Semiempirical description is given of the clogging of analytical nuclepore filters on the basis of experiments with latex aerosol and calculations concerning the evolution of the pressure loss and of the retention efficiency as a function of time. Both the pore radii and the number of the open pores were found to decrease during the clogging process which resulted in an increase in the pressure and in the retention efficiency of the filter. The values of the pressure loss and the retention efficiency as calculated from semiempirical formulae are in relatively good agreement with the experimental curves. It is possible to estimate the useful life of analytical nuclepore filters for the determination of particle size and particle size distribution, and to determine a critical particle count per pore.

47880 **APTIC NO. 67151**

Stahlhofen, W., L. Armbruster, and J. Gebhart

PARTICLE SIZING BY SINGLE PARTICLE OBSERVATION IN A SEDIMENTATION CELL. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 45-49. 36 refs. (Oct. 17-18.)*

The development and application of a sedimentation cell for particle size analysis are described. The settling time between two marks was measured to determine the terminal velocity of a particle. For monodisperse polystyrene spheres the agreement between the diameter measured by electron microscopy and the diameter calculated from the mean settling time was within 2%. The influence of Brownian motion on sedimentation was studied on a test aerosol of di-2-ethyl-hexyl-sebacate droplets having a relative standard deviation between 3 and 5%. For particles larger than 1.5 micron the Brownian motion becomes negligible and the sedimentation method can also be used for the determination of the standard deviation. The laser aerosol spectrometer measures the correct value of the original aerosol. Much larger standard deviations were found in the sedimentation cell as a result of diffusive broadening of the settling time in the cell.

47881 **APTIC NO. 70051**

Varmuza, K. and P. Krenmayr

CONTRIBUTION TO THE INTERPRETATION OF MASS SPECTRA WITH THE AID OF ADAPTIVE LINEAR CLASSIFIERS. *(Beitrag zur Interpretation von Massenspektren mit Hilfe adaptiver, linearer Klassifikatoren). Z. Anal. Chem., 266(4):274-281, 1973. 21 refs. Translated from German, 23p.*

Molecular structures of organic substances with low molecular weight can be determined with some probability from low resolution mass spectra by linear, binary, and adaptive classifiers. Two-hundred and fifty mass spectra were used as a training set to compute such classifiers for 31 different molecular structures; another 250 mass spectra were used to test the predictive ability. The best preprocessing of the spectral data was the logarithmic transformation of the intensities and normalization to the base peak. If the training set contains only some members of a certain class, the predictive ability is very low for spectra of this class, and the trained classifer is not useful. After critical examination, only 10 molecular structures remained which are suitable for this method of automatic mass spectra interpretation.

47882 **APTIC NO. 69388**

Waite, David A.

ANALYSIS OF AN ANALYTICAL TECHNIQUE FOR DISTRIBUTING AIR SAMPLING LOCATIONS AROUND NUCLEAR FACILITIES. *International Radiation Protection Assoc., Proc. Int. Radiat. Prot. Assoc., Int. Congr., 3rd, Washington, D. C., 1973, p. 406-410. 4 refs. (Sept. 9-14.)*

NTIS: CONF-730907-P1

An analytical mechanism is described for distributing air sampling locations around nuclear facilities, including reactors, fuel fabrication, fuel reprocessing, and research centers. The method was developed to facilitate the efficient incorporation of past experiences into environmental surveillance programs for new installations. The technique provides an initial distribution of air samplers around a site which correlates well with placements on sites which have been occupied by long-established programs with their inherent evolution and refinements. Sensitivities of calculated sampler distributions to various meteorologic and demographic input parameters are mentioned. The applicability of this approach is examined by comparing sampling locations in well-established air monitoring programs scattered worldwide with location distributions recommended by this mechanism. (Author abstract modified)

47883 **APTIC NO. 69651**

Waite, D. A. and W. L. Nees

A NOVEL PARTICLE-SIZING TECHNIQUE FOR HEALTH PHYSICS APPLICATION. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Rept. IAEA/SM-180/43, 8p., 1973 (?). 9 refs.*

NTIS: BNWL-SA-4658, Conf-731117-2

A new concept in the sizing of radioactive or nonradioactive airborne particulate matter was assembled into a mobile field unit and applied to present environmental and health physics particle size information needs. The glow-discharge perturbation method economically generates particle size data which can be directly accumulated and spectrometrically analyzed by a multichannel analyzer. The basics of the glow-discharge technique are touched upon and compared to other instrumentation presently available in this province of the environmental sciences. The physical description, operational characteristics, and current uses of the apparatus are detailed, along with important design and operational parameters. Particle size distribution data and analysis techniques illustrating the utility of this system are presented. The potential contributions to environmental surveillance of this approach appear to be many. Anticipated influences on the estimation of individual and/or population dose from airborne particulates and on the evolution of basic objectives of environmental surveillance programs are discussed. Applicability of this approach to some difficult problems in environmental data interpretation and utilization are addressed. Noteworthy among these are: the partition of responsibility for population radiation exposure among local contributors of airborne particulates, where differentiation by isotopic spectrographic means is difficult or impossible; the estimation of soil suspension importance to regional population lung exposures; and the economical provision of data usable for increasing the utilization of lung models in calculating population exposure. (Author abstract)

47884 APTIC NO. 69340

Yamate, Noboru and Akira Inoue

CONTINUOUS ANALYZER OF CARBON MONOXIDE IN AMBIENT AIR USING ELECTROCHEMICAL ANALYSIS. *(Kankyoyo issanka tanso jido keisoku ni tsuite - erekutoro kemi karu hoshiki). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(3):76-80, 1973.*

The new electrochemical potentiometric carbon monoxide meter, Model 2100 Ecolyzer, was given various tests for its performance. The meter records the CO level in the environment by dissolving CO in the electrolysis liquid and detecting the potential generated. The meter is portable and can be used as a continuous monitor by passing the sampled air through the diagram suction pump, the humidifier, and the filter to the censor. The generated potential is detected by electrodes and amplified for recording. The measurement limits are zero to 100 ppm. The reliability is + or - 0.1%. The effects of coexisting gases influencing the measurement to the extent of 1 ppm level of CO are: 0.5 ppm of ethylene, 2 ppm of nitric oxide, 8 ppm of nitrogen dioxide, 10 ppm of propane, 50 ppm of hydrogen, 190 ppm of sulfur dioxide, 1% of methane, and 10% of carbon dioxide had no effect. The censor withstood a 3000-hour test of continuous monitoring. The zero drift was within -0.6% and the span drift was within -1%. The calibration line was straight, and the response time was 25 sec for a 90% response and 35 sec for a 95% response. The results of a field test at a monitoring station agreed very well with the measurements of an infrared CO analyzer.

47885 APTIC NO. 69363

Zonov, Y. V.

ARTIFICIAL EARTH SATELLITES INVESTIGATE THE ENVIRONMENT. *(Iskusstvennyye sputniki zemlyi issleduyut okruzhayushch uyu sredu). Priroda, no. 12:2-9, Dec. 1973. 7 refs. Translation from Russian. National Aeronautics and Space Administration, Washington, D. C., NASA-TT-F-15-15,409, 23p., April 1974.*

NTIS: N74-27391

The problem of environmental pollution appears where the dispersion of pollutants emitted by natural and industrial sources is insufficient. The process of dissipation can be studied with artificial earth satellites (AES). These satellites have been used on several occasions, and gave clear photographs of plumes and condensations of factory fumes. Smoke from forest fires also was clearly seen. Lasers might be used in the future to measure invisible pollutant gases such as nitrogen oxides and sulfur dioxide. Artificial earth satellites may also be used to study smog associated with large industrial centers. Water pollution could also be studied. A world monitoring system might be set up utilizing satellites.

47886 APTIC NO. 69197

Kanagawa Prefectural Pollution Control Center and Kanagawa Prefectural Industrial Experiment Station

DUST CONCENTRATION MEASUREMENT FOR FLUE GASES AND SIMPLIFICATION OF HEAVY METAL SAMPLING PROBES. *(Endo haigasu chu no baijin nodo sokutei oyobi jukinzoku bunsekiyo shiryo saishu no kanika). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 15:232-235, Feb. 1973.*

The determination of soot particulate and heavy metal concentration in flue exhaust gases is an important aspect of controlling atmospheric pollution. The sampling procedures are outlined in J I S Z8808. The commercial dust tubes used for particulate collection have deficiencies such as pressure loss, variations in the quality of glass wool, and excessive length of collection time for heavy metal samples. Inaccurate analysis results. Therefore the dust tube was modified using cylindrical silica wool filter paper to catch the samples. Pressure loss was low (100 mm H2O at a flow rate of 20 l/min). Experimentally, collection of fly ash (average diameter, 14 micron) resulted in 100% yield. The silica wool filter paper attained a constant weight after initial water loss upon heating to temperatures ranging from 110 C to 700 C. It was possible to obtain workable concentration measurements for dust and heavy metals, even by taking particulate samples only at the midpoint of the flue.

47887 APTIC NO. 69390

Stichting CONCAWE, Hague,(Netherlands), Special Task Force on Study of Air Pollution Sampling and Survey Techniques

METHODS FOR THE DETERMINATION OF SO2 IN THE ATMOSPHERE. *Rept. 6/73, 55p., Sept. 1973. 95 refs.*

The many methods used to determine sulfur dioxide in the atmosphere are given to provide guidance for selecting the most appropriate analytical method for the work in progress. Methods are classified as quantitative discontinuous analysis methods or quantitative automatic field methods. The first group of methods include determination of SO2 after oxidation to sulfate ion by hydrogen peroxide (titration with alkali, titration with barium chloride, and colorimetric with methyl thymol blue), determination after reduction to hydrogen sulfide (Stratmann s silica process), direct colorimetry (West and Gaeke procedure), and determination based on physical qualities or changes (gas chromatography and flame photometry). Quantitative automatic field methods include: conductimetric analysis (Ultragas-3 and picoflux), pH sensing (sulfur smoke continuous recorder), coulometric analysis, colorimetric analysis, flame photometry, electrochemical methods using a membrane, second derivative ultraviolet spectrophotometry, correlation spectrometry, and additional methods (conductimetric, pH recording, coulometric, and photometric). Calibration is recognized as a vital part of the instrumentation, and static and dynamic techniques for calibrating the various instruments are described. Since many of the methods are nonspecific, a short review is given of selective filters. Cost data are given as an approximate guide to relative process. (Author summary modified)

47888 APTIC NO. 69789

Gulf Oil Canada Ltd.

GULF OIL CANADA LIMITED RESEARCH AND DEVELOPMENT DEPARTMENT ENVIRONMENTAL STUDIES MOBILE LABORATORY. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 142-145. (Nov. 1-2.)*

A mobile monitoring unit is described for measuring ambient air quality and source emissions. The monitors are mounted in instrument racks and on benches in a specially designed 30 ft Bluebird bus powered by an eight-cylinder gasoline engine. The laboratory is self-contained and can operated from shoreline power or its own diesel generator. Samples of outside air are drawn through a sample port on a mast 25 ft above the ground. Pollution levels can be correlated with weather parameters. Wind speed and direction, rainfall, humidity, temperature, solar radiation, and barometric pressure are measured. Air quality monitors are available for sulfur dioxide, sulfur compounds, hydrogen sulfide, particulates, oxides of nitrogen, ozone, total hydrocarbons, hydrocarbons, and carbon monoxide. Source monitors are available for sulfur dioxide, sulfur compounds, HC, NOx, flue gas, flow, differential press, and temperature.

47889 APTIC NO. 69986

National Electrical Manufacturers Assoc., New York

OFFICIAL STANDARDS PROPOSAL. *Pub-CP-P1-1973, Pub-TR-P6-1973, 44p., Jan. 25, 1973. 8 refs.*

Proposed American national standard guidelines are given for handling and disposal of capacitor- and transformer-grade askarels containing polychlorinated biphenyls. Various safety precautions for the shipment of askarel, vapors from askarel, manufacturing of askarel, and disposal of askarel wastes are given. Commercial disposal service companies and laboratories offering services for polychlorinated biphenyls (PCB) are listed. A tentative electron capture gas chromatographic method for measuring PCBs is described. The method can be used to measure PCBs in the air. A method for analyzing water and sediment for PCBs is also described.

1972

47890 APTIC NO. 69763

Appel, Bruce R. and J. J. Wesolowski

SELECTION OF FILTER MEDIA FOR PARTICULATE SAMPLING WITH A LUNDGREN IMPACTOR. *California Air resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 25p. 5 refs. (Oct. 30-31.)*

Selected filter media were examined to determine their suitability as the after-filters of the Lundgren impactors for an aerosol characterization study. Since the particles to be collected were to be analyzed for elemental composition by X-ray fluorescence analysis and neutron activation analysis and for information on sulfur, nitrogen, phosphorus, and lead contents and oxidation states by electron spectroscopy for chemical analysis, severe restrictions were placed on the filter media. A filter medium which permitted all desired analyses while maintaining desirable sampling properties was studied. A 47 mm, 5 micron cellulose ester filter can be employed at 3 cu ft/min as a highly efficient after-filter for the Lundgren impactor according to the experimental results. A Gelman GA-1 5 micron cellulose ester filter will permit particulate analysis by X-ray fluorescence, neutron activation analysis, and except for nitrogen compounds, by electron spectroscopy for chemical analysis. To overcome the latter deficiency, two alternatives will be explored. The filtration efficiency data presented can be extended by a more detailed study of face velocity effects. The study would also be enhanced by experiments employing particles of known size. Such experiments should be carried out when time and funding permit. (Author conclusions modified)

47891 APTIC NO. 69773

Blumenthal, D. L. and D. S. Ensor

MONITORING OF AIR POLLUTION FROM AN AIRBORNE PLATFORM. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 22p. 12 refs. (Oct. 30-31.)*

Considerations for the planning, execution, and data analysis of an airborne sampling project are discussed. Rapid response solid state air pollution sensors and light reliable data logging systems have made these techniques feasible on a large scale. In addition to the usual laboratory considerations of reliability, stability, and accuracy for air pollution instrumentation, weight, bulk, and time response of the instruments are important for airborne application. Airborne air pollution measurements are most meaningful when integrated with all the available meteorological data. Several types of airborne platforms are discussed, including fixed wing aircraft, helicopters, and balloons. The design of sampling systems and sampling ports, components of air monitoring systems, and sampling patterns are also discussed. (Author summary modified)

47892 APTIC NO. 69623

Dimeff, John, Ralph W. Donaldson, Jr., William D. Gunther, and Gordon J. Deboo

NONDISPERSIVE INFRARED ANALYZER FOR SPECIFIC GASES IN COMPLEX MIXTURES. *NASA Tech. Brief, TB 72-101 98, 7p., May 1972.*

A nondispersive infrared analyzer for identifying and measuring specific gases in complex mixtures is described which permits the arbitrary and convenient selection of a particular gas to be analyzed and minimizes spurious signals introduced by other gases in the mixture. The above is accomplished by modulating the densities of a reference gas and the unknown gas mixture in such a way that a mixing of absorption effects on light energy passing through the gases to a photodetector produces a signal component that is related to the absorption caused by the reference gas component in the unknown gas mixture. The unknown gas mixture and the reference gas are contained in windowed cells, and the gas densities are caused to vary periodically by mechanically operated bellows. The density of the reference gas is caused to vary at one frequency by the compressor bellows, while the density of the unknown gas mixture is varied at a second frequency. The two signals are then beat against each other in a mixer to produce a difference signal which is led to an electrical detector which is capable of selecting from one input signal a particular signal component corresponding to another input signal. The output of the difference signal from the electrical detector has an amplitude that is directly proportional to the concentration of the specific gas in the unknown. This output signal is fed into a readout system for display or recording.

47893 APTIC NO. 69558

Gilfrich, J. V., P. G. Burkhalter, L. S. Birks, and Jack Wagman

X-RAY FLUORESCENCE ANALYSIS OF AIR POLLUTION PARTICULATES. *Am. Chem. Soc., Div. Water, Air Waste Chem. Preprint, 12(2):222-227, 1972. 5 refs. (Presented at the American Chemical Society National Meeting, 164th, New York, Aug. 28 - Sept. 1, 1972.)*

Measurements of elemental composition of airborne particulates via crystal spectrometry and energy dispersion are compared, using isotope sources, X-ray tubes, and a proton accelerator. X-ray fluorescence analysis appears to be the best method for multi-element analysis of large numbers of airborne particulate samples on a routine basis and at low cost. Modern multi-channel simultaneous X-ray fluorescence analyzers are equipped with as many as 24 crystal spectrometers which can measure that many elements in a single counting interval. The advantage provided by the excellent resolution of crystal spectrometers outweighs the features claimed for energy dispersive techniques, except possibly when used with proton excitation for special cases. Detectable limits are tabulated for various elements of test samples using particle excitation, radioisotope excitation, and X-ray tube excitation. Analytical results are also presented for municipal incinerator particulate samples using X-ray tube excitation and crystal spectrometer measurement.

47894 APTIC NO. 69770

Hollowell, Craig D., Glenn Y. Gee, and Ralph D. McLaughlin

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: SO2 INSTRUMENTATION. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf.*

Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 31p. 2 refs. (Oct. 30-31.)

Instrumentation for environmental monitoring was surveyed including monitors of air quality, water quality, radiation, and biomedicine. Sulfur dioxide instrumentation is described which forms the basis of present day commercial instrumentation, and future instrumentation is discussed. the analyzer part of monitoring instrumentation is mainly discussed. Conductimetric, colorimetric, amperometric (coulometric), electrochemical transducer, flame photometry, and gas chromatographic-flame photometry, nondispersive absorption spectrometric, dispersive absorption spectrometric, correlation spectrometric, second derivative spectrometric, condensation nuclei formation, mass spectrometric, chemiluminescent, and other new analytical methods for SO2 measurement are described. Commercial instruments are listed with models, measuring range, response time, cost, and multi-parameter capability.

47895 **APTIC NO. 69764**

Husar, Rudolf B. and Steven L. Heisler

ATMOSPHERIC PARTICULATE MASS MONITORING WITH A BETA RADIATION DETECTOR. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 13p. 6 refs. (Oct. 30-31.)*

The use of a beta radiation detector for semi-continuous atmospheric particulate matter monitoring was investigated experimentally. Gravimetric calibration using sodium chloride, cigarette smoke, and atmospheric aerosols indicated that a consistent linear relationship between aerosol mass concentration and beta radiation attenuation exists. the accuracy of detection was + or - 10 micrograms, which at an ambient particulate concentration of 100 micrograms/cu m permits the mass concentration measurement every hour. The sensitivity of the monitor to relative humidty and temperature was also determined. (Author abstract modified)

47896 **APTIC NO. 69765**

Lee Robert E., Jr. and Howard Crist

TRACE ANALYSIS IN SOURCE TESTING. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 8p. (Oct. 30-31.)*

To determine the environmental impact from trace element emissions, the trace element composition of fuels and particulates collected with the Environmental Protection Agency source sample train was determined. The simultaneous multielement analyses most frequently used were optical emission spectrography, spark source mass spectrometry, and neutron activation. These techniques were supported by other trace analysis methods including anodic stripping voltametry, atomic absorption, conductometric titrations, ion specific electrode methods, and wet chemistry. The advantages and disadvantages of these methods, precision of data, and findings to date are summarized. Considerable information can be gained relatively inexpensively if the industrial feed material, such as ore or coal, is first analyzed before a source test is initiated. Such an analysis is helpful in determining the need or scope of a source test. More measurements are needed of the size distribution of particles in various sources, especially as a function of the trace element composition. The validity of the results is being tested by conducting interlaboratory comparisons on source emission samples. Valuable information is also gained on analytical methodology and equivalency where several techniques are used to analyze the samples. A recent example of this type of activity is illustrated by the determination of fluoride by four laboratories using four different techniques in measurement of the samples.

47897 **APTIC NO. 69768**

Levaggi, Dario A. and Jane Tang

INTEGRATING COLLECTION METHODS FOR NO2. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 4p. (Oct. 30-31.)*

The need for an integrating, 24-hour, manual method for measuring nitrogen dioxide has led to the development of a method consisting of absorption of NO2 in a solution containing triethanolamine and butanol. The absorbed nitrite is then determined by conventional diazotation and coupling. The absorption solution has a high collection efficiency and a constant stoichiometry. Precision and accuracy are excellent, and field data compare favorably with the automated Saltzman instrumentation.

47898 **APTIC NO. 69774**

Linsky, Benjamin

STATIONARY SITE VERSUS MOBILE AIR POLLUTION SAMPLING UNITS - OLDER SOLUTIONS AND MODERN REQUIREMENTS TO AVOID PRESENT HINDRANCES. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 6p. 5 refs. (Oct. 30-31.)*

A wider choice of secure sites for mobile and stationary air monitoring instruments would be available if purchase and design specifications produced quiet instruments with other psychologically sound features. Skilled volunteers might be able to provide more sampler service if the samplers could be housed without annoyance or undue intrusion. Further protection by shielding and vibration isolation, and bump- resistance would further improve the utility and spread of such instruments. Calibration systems and services need to be further developed and provided. Radio-dispatching systems are recommended for better use of the more mobile sampling units. Par vegetation photography requires support by specialists in plant diseases. (Author summary modified)

47899 **APTIC NO. 69769**

Mueller, Peter K., Emil de Vera, SuzAnne Twiss, Theodore Belsky, and Wayman Siu

THE SIMULTANEOUS MODE FOR NO - NO2 ANALYSIS: AN ANNOTATED OUTLINE. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 16p. 5 refs. (Oct. 30-31.)*

In the parallel mode nitric oxide-nitrogen dioxide analysis, the sample is split into two equal parts. One part is passed directly into an absorbing solution containing a Saltzman-type reagent where NO2 is measured. The second part of the airstream, containing NO and NO2, is passed through an acid permanganate scrubber where NO is oxidized to NO2. The original NO2 and the converted NO2 then pass to a scrubber containing a Saltzman- type reagent for measurement of total NOx. The NO is then determined by subtracting the NO2 value from the NOx value. In the series mode, the air sample is passed through the Saltzman-type reagent where the NO2 is absorbed and recorded. The effluent stream now containing only NO is passed through an acid permanganate scrubber where it is oxidized to NO2 and subsequently determined photometrically in a second scrubber containing Saltzman-type reagent. In the simultaneous mode, NO2 is determined as in the parallel and series mode, but the NO is determined independently of the NO2. Problems with the parallel and series mode are such that significantly different results for NO and therefore for NOx are obtained. Both series and parallel modes for NO and NO2 analysis preclude accurate assessment of NO and NOx concentrations in polluted air. To resolve the problem of obtaining authentic data, several NO2 absorbing reagents were investigated. A solid absorber composed of triethanolamine impregnated on firebrick which is 100% efficient in trapping NO2 while completely passing NO is now recommended. The quantitative oxidation of NO was also studied to give better results. The simultaneous mode was compared with the parallel mode and with chemiluminescent determinations of NO. The simultaneous mode is suitable for obtaining accurate atmospheric NO and NO2 data. Existing analyzers working on the azo-dye principle can be easily modified without further investment in equipment.

47900 **APTIC NO. 69776**

Perry, Francis R.

MOBILE SURVEILLANCE UNITS. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg Studies, 13th, Berkeley, Calif., 1972, 8p. (Oct. 30-31.)*

Since California's present 85 air monitoring stations were not adequate, a system of mobile monitoring units was developed to assess air quality in areas where there has been limited or no air monitoring, to determine the distribution of pollutants about an existing nonmobile station, to determine the best locations for new permanent stations, to determine the transport of pollutants, and to assess air quality near point sources. At present there are three trailers in operation, and six vans will be in operation by 1973. The features of the trailers, large self-propelled vans, and small self-propelled vans are described including instrumentation and costs. The trailers will monitor total oxidants, nitrogen dioxide, nitrogen oxide, carbon monoxide, total hydrocarbons, wind speed and direction, and total particulate matter. The large vans will monitor nitric oxide, NOx, total HC, methane, CO, suspended particulates, and wind speed and direction. The small vans will sample one to three parameters.

47901 **APTIC NO. 69772**

Pierce, Louis, Richard Mosley, and Evaldo Kothny

THE DETERMINATION OF H2S. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 7p. 12 refs. (Oct. 30-31.)*

The standard manual method of hydrogen sulfide quantitation in the ppb range is discussed. Some recent and current efforts in method development are reviewed. The standard method can be used to determine H2S levels in air, to determine compliance with government air quality standards, to check the accuracy of instrumental methods, and to calibrate continuous analyzers. The development of several methods is reviewed. The methods discussed are methylene blue colorimetric analysis, colorimetric cyanide analysis, and fluorometric methods. The limitations of current methods and new approaches are also described.

47902 **APTIC NO. 69315**

Prengle, H. William, C. A. Morgan, C. S. Fang, P. Campani,
W. W. Wu, L. K. Huang, E. G. Felton, and U. Mahagaokar

REMOTE SENSING OF POLLUTANTS IN GAS PLUMES BY INFRARED EMISSION RADIOMETRY-SPECTROSCOPY (FINAL REPORT). *Houston Univ., Tex., Chemical Engineering Dept., Environmental Protection Agency Research Grant AP 00578, 74p., March 1, 1972. 58 refs.*

NTIS: PB 229798

Results of a study on the application and development of quantitative methods for the determination of pollutants from emission sources by remote sensing, combining infrared radiometry and spectroscopy, are presented. The method was feasible. Generalized temperature and concentration models, based on the theory plus certain empirical factors were developed, and their application demonstrated. Field measurements at 65 m distance on gas-fired power plant plumes at temperatures of 500-600 K were made. Carbon monoxide, nitric oxide, nitrogen dioxide, methane and saturates, and ethylene and unsaturates concentrations were determined. Temperatures were determined to within + or - 10 K and concentrations to within + or - 28% of the value over the range of 10-10,000 ppm. Extension of the method to temperature and concentration gradients, fluctuations in plumes due to chemical reactions, and measurements at greater distances appear to be feasible. (Author abstract)

47903 **APTIC NO. 69766**

Price, Monty A. and Edgar R. Stephens

IMPACTION TECHNIQUES FOR INFRARED ANALYSIS OF AMBIENT AIR AEROSOL. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 14p. 2 refs. (Oct. 30-31.)*

Impaction of aerosols is an analytical technique used in several commercially available samplers such as the Lundgren and Anderson impactors. In most cases, the collected samples are analyzed by wet chemical methods for nitrate, nitrite, sulfate, and halogens and by atomic absorption for metals. A technique is described for impacting aerosols on salt windows and polished metal plates. The samples are then scanned on an infrared spectrophotometer. The collector consists of two impactors connected in a series. Samples of ambient air and exhausts from gasoline and diesel-powered automobiles were collected and used to test the sampler. The design of the sampler and typical spectrum from the tested samples are described.

47904 **APTIC NO. 69775**

Shirley, Earl

AIR QUALITY MEASUREMENTS FROM A HIGHWAY PERSPECTIVE. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 16p. 6 refs. (Oct. 30-31.)*

A program to measure air quality at a highway using instrumented mobile vans is discussed. The data will serve as input to an environmental impact statement. The legal requirements for environmental studies, major laws and regulations governing air quality impact studies for highway projects, and pollutant effects on the air environment are reviewed. The essential parts of an air quality study are described which consist of source strength estimates, transport and dispersion parameters, the output of predictive modeling, and ambient air quality studies. The specific ambient air quality survey to define the background levels of pollutants in the project area is described, and the sampling and analytical equipment and procedures for the study are reviewed.

47905 **APTIC NO. 69777**

Taylor, M. V. and G. L. Shahinian

GAS PHASE ANALYZERS FOR OZONE AND NITROGEN OXIDES. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 6p. 14 refs. (Oct. 30-31.)*

Several gas phase analyzers for ozone and nitrogen dioxide are described which give much faster response times, are smaller, and are easier to service and maintain than wet chemical units.

Ultraviolet photometry for ozone measurement, chemiluminescent ozone analyzers, and chemiluminescent nitric oxide-nitrogen oxide analyzers are described.

47906 **APTIC NO. 69778**

Wendt, J. G., H. Faigin, and J. M. Shikiya

AUTOMATIC GAS CHROMATOGRAPHIC ANALYSES OF HYDROCARBONS AT ATMOSPHERIC CONCENTRATIONS. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 14p. 2 refs. (Oct. 30-31.)*

The general theory of operation, maintenance requirements, and precautionary steps for the operation of a five-component automatic gas chromatograph are presented. The five-component automatic gas chromatograph is the most complex unit on the market today. The instrument is capable of determining total hydrocarbon, methane, ethane, ethylene, acetylene, and carbon monoxide at atmospheric monitoring levels. The automatic gas chromatograph contains four basic sub-systems: a chromatograph detector, a temperature-controlled oven, an electronics package, and a flow system. These systems are described.

47907 **APTIC NO. 69771**

White, Kenneth L., A. Clyde Hill, and Jesse H. Bennett

ATMOSPHERIC SO2 DETERMINATION IN THE PPB RANGE BY THE PARAROSANILINE METHOD. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 7p. (Oct. 30-31.)*

The West and Gaeke pararosaniline spectrophotometric method is the most widely used method for measuring atmospheric sulfur dioxide. The method is applicable to measurement of SO2 in the 0.001 to 5 ppm range. Measurement of SO2 in remote areas and estimates based on SO2 emissions, however, indicate that SO2 background concentrations may be well below this limit. Little data are available substantiating the efficacy of the method for measuring SO2 in the ppb range. Therefore SO2 was measured in a remote desert canyon. Initial SO2 measurements with the West-Gaeke method indicated that the ambient SO2 concentration was well below the accepted limits of detectability by this method. Since sensitivity depends on increased air sample volumes, higher flow rates and longer sampling times were employed which should have allowed measurement of SO2 in the 0.01 ppb range, assuming 100% efficiency in sampling. When most samples taken under these conditions still did not contain significant amounts of SO2, an evaluation of the method in the ppb range under field conditions was undertaken. Dichlorosulfitomercurate stability aeration and field conditions and overall efficiency were studied. At low SO2 concentrations, sampling efficiency dropped below one due in part to loss of dichlorosulfitomercurate complex with continued aeration. These results should not be generally applied to other sampling situations in which atmospheric and environmental conditions may differ from those encountered in the study. Measurements of background pollutant concentrations in other areas with this and similar wet chemical methods should include measurement efficiency determination in the ppb or lower concentration range.

47908 **APTIC NO. 69767**

Wright, Barbara and Edward Jeung

SIMPLIFIED CALIBRATION PROCEDURE FOR CHEMILUMINESCENT NO-NOX ANALYZERS. *California Air Resources Board; California Univ., Berkeley, Dept. of Mechanical Engineering; and California State Dept. of Public Health, Air and Industrial Hygiene Lab., Conf. Methods Air Pollut. Ind. Hyg. Studies, 13th, Berkeley, Calif., 1972, 8p. 4 refs. (Oct. 30-31.)*

Chemiluminescent methods for monitoring atmospheric concentrations of nitrogen oxides are based on the detection of light produced by the reaction between nitric oxide and ozone. The intensity of light produced is proportional to the concentration of NO. For measurement of NOx, the sample air is first passed through a converter which reduces nitrogen dioxide to NO. Since total NOx is defined as the sum total of the NO and NO2 concentrations, the NO2 concentration is simply determined by the difference. Various instrument designs utilizing the chemiluminescent principle are available commercially. Some of these are listed. A simplified calibration method for chemiluminescent NO-NOx analyzers is described involving two phases. The first phase is accomplished by generating known concentrations of NO gas and introducing these to both NO and NOx channels to obtain calibration data from the O3/NO detector system. The second phase is similar to the first, differing only in that a portion of the known NO stream is oxidized to NO2 to provide a mixed stream of NO and NO2. This mixture is routed to the NOx channel, and by comparing the values before and after oxidation, the determination of converter efficiency is accomplished. The procedural details are described.

47909 **APTIC NO. 67123**

IG-TNO Research Inst. for Public Health Engineering, Delft (Netherlands)

REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF ENVIRONMENTAL POLLUTANTS. *18p., Dec. 1972. 150 refs.*

Automated methods for the sampling and analysis of various environmental pollutants found in indoor and outdoor air, water, soil, and biological media such as urine are tabulated by medium, apparatus, limits of detection, reference reports and publications, and special remarks. Pollutants listed include: organic acids, aldehydes, alcohols, particulates, carbon monoxide, carbon dioxide, halogen compounds, metal compounds, hydrocarbons, halogenated hydrocarbons, hydrogen, hydrogen peroxide, ketones, oxides of nitrogen, oil mists, ozone, oxygen, phenols, silicates, solvent vapors, sulfur oxides, sulfuric acid, sulfur, and isocyanates.

1971

47910 **APTIC NO. 75025**

Duewel and Buehne

DEVELOPMENT OF A RECORDING CONTINUOUSLY MEASURING INSTRUMENT FOR MONITORING THE DUST EMISSIONS OF LARGE GARBAGE-BURNING INSTALLATIONS. *(Entwicklung eines registrierenden kontinuierlichen Messgeraetes fuer die Ueberwachung der Staubemission grosser Muellverbrennungsanlagen). Duesseldorf Municipal Undertakings (West Germany), Central Div. for Maintaining Clean Air Experts and Technischer Ueberwachungs- Verein Rheinland e.V. (West Germany), Zentralabteilung Luftreinhaltung, Rept. 622, 1971. Translated from German, 51p.*

A smoke density measurement instrument was tested for its suitability for recording smoke and soot emissions behind a garbage-burning installation. The minimum requirements established and the test site are described. The test covered a period of 3 months. All minimum requirements were met with the exception of establishing an unequivocal connection between extinction (recording of smoke density) and gravimetric dust content. The photoelectric instrument offers operating personnel the possibility of optimal fire direction with regard to smoke and soot development.

47911 **APTIC NO. 69908**

Halstead, C. J. and A. J. E. Munro

THE SAMPLING, ANALYSIS AND STUDY OF THE NITROGEN OXIDES FORMED IN NATURAL GAS/AIR FLAMES. *Preprint, 22p., 1971. 20 refs.*

(Presented at the Natural Gas Research and Technology Conference, 1st, 1971, Paper 2.)

The present state of an experimental program for the study of the extent and rate of formation of nitrogen oxides in natural gas air flames is described. The investigation includes: evaluation of suitable analytical techniques, taking into account versatility, interference by other species, convenience, and accuracy; a study of the sampling procedures that are necessary if true measurements of NOx concentrations in the flames and the combustion products are to be obtained; and the application of these techniques to the practical determination of the rate of formation of NOx and of the effect of flame stoichiometry on the final NOx levels in a medium-sized (120 kW) natural gas-fired combustion system. An extension of the program, which includes a practical and theoretical investigation of the effect on NOx formation of modifications to the combustion system, is also described. The analytical techniques discussed are nondispersive infrared analysis and the Saltzman technique. (Author abstract modified)

47912 APTIC NO. 67071

Harman, J. N., III

CONTINUOUS COULOMETRIC ANALYSIS OF AMBIENT OXIDES OF NITROGEN (NO AND NO2). *Preprint, Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-554.)*

The bulk of all data collected on ambient air nitrogen dioxide and nitric oxide levels has been based on the manual or continuous, automated colorimetric determination of NO2 by the Griess-Saltzman reaction. Some of the problems with this technique associated with maintenance, complexity, and cost, made it desirable to develop a less expensive, more reliable, easily maintained, and accurate method based on the Hersch cell. The Hersch cell operates on the principle of secondary coulometric titration in either the galvanic (oxidant species) or electrochemically driven (reductant species) mode. It is a very sensitive technique using the electron as a titrant. The NO2 analyzer using a Hersch cell operating in the galvanic mode for the detection of NO2 at levels up to 1 ppm is discussed. Ozone is used for conversion of NO to NO2.

47913 APTIC NO. 69666

Jagusiewicz, A. and A. Telesnicki

CHARACTERISTICS OF INDUSTRIAL ODORS. *(Charakterystyka wyziewow przemyslowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 5(1):19-26, 1971. 3 refs.*

NTIS: TT 72-54022/1

The formation and mechanism of perception of odors are described. The sensation of odor occurs as the result of direct contact of odorant molecules with the sensory cells in the nose. It is highly probable that humans perceive only 25-30 primary odors, all other odors being only more or less complex combinations of the primary odors. The nose is sensitive for gas analysis, and is capable of detecting certain substances at concentrations as low as 2 times 10 to the -10th power mg/l air and of discerining from a few to over 10,000 odors. Odor intensity may be described by using degrees of a conventional scale which reflects odor sensation. Odors can also be described by quality and character. The degree of emission of odors from an industrial plant may be expressed as the number of odor units per unit time, which is practically equivalent to the flow rate of clean air required to dilute the odorant to the threshold level. The odor units represent the ratio of odorant concentration to its threshold concentration. Recognition odor thresholds were measured for a number of chemical compounds in a special test chamber. The thresholds determined in the laboratory by panelists are listed. The quality of odor may also be defined in terms of the Crocker-Henderson classification which involves four types of odors: fragrant or sweet, acid or sour, burnt or empyreumatic, and caprylic, goaty, or oenanthic.

47914 APTIC NO. 69537

Lao, R. C., R. S. Thomas, J. L. Monkman, and R. F. Pottie

MASS SPECTROMETRIC IDENTIFICATION AND MEASUREMENT OF POLYCYCLIC AROMATIC HYDROCARBONS FOUND IN AIR POLLUTANTS. *Dept. of Fisheries and Forestry, Ottawa (Ontario), Air Pollution Control Div. and National Research Council, Ottawa (Ontario), Chemistry Div., APCD 71-5, 35p., 1971. 15 refs. (Presented at the International Symposium on Identification and Measurement of Environmental Pollutants, Ottawa, Ontario, June 15, 1971.)*

Data on the mass spectra of polycyclic aromatic hydrocarbons was compiled in conjunction with ultraviolet and optical fluorescence wavelengths and intensities being accumulated. Of particular interest were the carcinogenic compounds benzo(a)pyrene (BaP), benzo(a)anthracene (BaA), and benzo(e)pyrene (BeP), and the noncarcinogenic compounds benzo(k)fluoranthene (BkF), benzo(g,h,i)perylene (BghiP), and coronene (Cor). The usual analytical procedures used for polycyclic aromatic hydrocarbon analysis require that the instrumentation be calibrated by pure examples of the compounds or, at the worst, with samples of known purity. The mass spectrometer is useful in assessing the purity of these compounds, and will probably become the standard instrumental criterion used in such purity evaluations. A solid inlet system was designed and constructed. Representative samples of the important polycyclics from all known sources and suppliers were investigated by the special system, and the degree of purity was established for each reference compound. The heats of vaporization of BaP and BkF were established; these thermodynamic properties will be of interest in the field of the quantitative sampling of airborne polycyclic compounds. A number of polycyclic aromatic hydrocarbon mixtures of known composition were analyzed. The mass spectrometric assay was in good agreement with fluorescence measurements made on the same sample. A very practical advantage of the mass spectrometric procedure was that these analyses were performed without having to do a preliminary chromatographic separation. It ultimately is possible to make mass spectrometric assays by the direct insertion of the airborne particultes, which would mean a great saving in time and labor, since extraction and chromatography would be eliminated. (Author abstract modified)

47915 APTIC NO. 67057

Morgan, George B. and Guntis Ozolins

AIR QUALITY SURVEILLANCE. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 152-153.*

The measurement of the atmospheric concentration of air pollution is discussed. States are required by the Clean Air Act Amendments to monitor for total suspended particulates, carbon monoxide, ozone, sulfur dioxide, total hydrocarbons, and photochemical oxidants. Information on pollution levels is obtained through the operation of networks of monitoring stations. The development of source and emission inventories, through stack measurements, questionnaires, and engineering calculations, provides information on the types and amount of pollutants emitted into the air and identifies the sources of pollution. An air quality monitoring system is composed of sampling measurement networks, laboratory support, and data handling and analysis. Trends in urban air quality are discussed including particulates, sulfur dioxide, metals, and gases.

47916 APTIC NO. 67072

Poli, A. A.

AIR MONITORING FOR CARBON MONOXIDE AND METHANE WITH A SINGLE ANALYZER. *Preprint, Instrument Society of America, Pittsburgh, Pa., 5p., 1971. (Presented at the Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-553.)*

A method is described for the rapid slug monitoring of air samples to give a continuous and unattended record of carbon monoxide and methane content on one analyzer, in the low ppm range. The physical and electronic makeup of the system based on gas chromatography are discussed. Alternate configurations are discussed, showing components in the air sample that can be measured along with CO and CH4. Long-term data is presented to show instrument reliability and precision. The process gas chromatography instrumentation does not have sensitivity and cross-sensitivity as a problem. Calibration is easier and less expensive in a multiple component chromatograph than in separate flow through monitors. Expandability or the ability to change the analysis both in quality and sequence can be considered an advantage. The system can be reliably used in air pollution monitoring. (Author abstract modified)

47917 **APTIC NO. 69341**

Reiter, Reinhold

NEW WAYS AND PROCESSES FOR DETECTION OF ATMOSPHERIC SUSPENDED SUBSTANCES. *(Neue Wege und Verfahren zur Erfassung atmosphaerischer Schwebstoffe). Text in German. In: Beispiele Angew. Forsch., Fraunhofer-Ges. Foerder. Angew. Forsch., p. 128-136, 1971. 9 refs.*

A study on the chemical composition of the Central European background aerosol, and an aerosol retention simulator are described. Correlation between the origin of air masses and the chemical composition of the aerosols carried by them was determined on the basis of aerosol samples collected near Garmisch-Partenkirchen. The aerosol concentration was highest in continental polar air and in air from Greenland, and lowest in warm, maritime polar air. Silica, potassium, sodium, and calcium were the chief components of the background aerosol. The relatively high content of water-soluble compounds and the low calcium concentration were determined in continental polar air, while tropical maritime air was characterized by very high content of water-soluble and water-insoluble calcium compounds. A retention simulator developed for the simulation of aerosol particle retention in the consecutive sections of the respiratory tract is based on the cascade impactor principle with aerosol filters in four stages and a thorium bromide tracer for the detection of the aerosol deposit on the filter band by means of a scintillation detector. The simulator is suitable for the automatic, continuous determination of aerosols, and in particular for the time behavior and retention of aerosols at different distances from the emission source.

47918 **APTIC NO. 67115**

Tsuji, Kusuo

STUDIES ON THE SUSPENDED PARTICLES IN AIR. I. DETERMINATION OF COPPER, LEAD, CADMIUM AND ZINC IN AIR BY LOW TEMPERATURE RADIO FREQUENCY OXIDATION APPARATUS AND POLAROGRAPHY. *(Taikichu no fuyu funjin ni kansuru kenkyu (daiipo) teion kaika sochi to poraroguratu-ho ni yoru fuyu funjinchu no do, namari, kadomiumu, aen no teiryo). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci. (Tokyo)), vol. 89:21-24, 1971. 6 refs.*

The use of low temperature radio frequency oxidation followed by polarography is described for the direct determination of lead, copper, cadmium, and zinc in suspended particulates. A glass or polystyrene fiber filter with adsorbed fine particles on its surface is inserted into the low temperature radio frequency oxidation apparatus, and the particles are ashed under the following conditions: oxygen flow rate of 70 ml/min, 150 watt output power, and 3 hrs of heating at 100 C. The ash obtained is extracted twice with 10 ml of hydrochloric acid, and the acid extract is diluted to the concentration required for the test. The most suitable pH value is around 7.2. Half wave potentials for Cu, Pb, Cd, and Zn are minus 0.16, minus 0.47, minus 0.67, and minus 1.19 volts (versus a standard calomel electrode), respectively, in the measuring range of 0-minus 1.40 volts.

1970

47919 **APTIC NO. 69911**

Aleksandrov, E. L.

MEASUREMENT OF CONDENSATION NUCLEI AND CLOUD NUCLEI CONCENTRATIONS (A SURVEY). *Hydrometeorological Service (USSR), Main Administration and Inst. of Experimental Meteorology (USSR), Probl. Fix. Oblakov Akt. Vozdeistv., Moscow, USSR, 1970, no. 19. 115 refs. Translated from Russian in: Cloud Physics and Weather Modification, Proc., p. 40-65, 1974, by H. Olaru, Israel Program of Scientific Translations, Jerusalem.*

NTIS: TT 73-50031

Literature devoted to the measurement of condensation nuclei and cloud nuclei concentrations are surveyed in detail. Adiabatic, multitemperature, and isothermal (chemical diffusion) methods of creating supersaturation in nuclei counters are discussed. The design features of the various instruments and their merits and drawbacks are described. Sources of errors in different instruments are discussed. Data on the supersaturation in nuclei counters based on adiabatic expansion are reviewed.

47920 **APTIC NO. 69675**

Kaaijk, Joke

AN ATMOSPHERIC HYDROGEN FLUORIDE MONITOR. *Preprint, Chemical Lab. TNO, Rijswijk (Netherlands), 8p., 1970 (?). 3 refs.*

A sampling and analytical technique for measuring hydrogen fluoride is described. Gaseous fluorides are separated from particulate matter in a miniature cyclone. The gaseous fluorides are collected in a buffer solution which circulates continuously in the measuring cell. A fluoride electrode and a reference electrode are fixed in the measuring cell. The fluoride electrode responds to free fluoride ions. The potential developed by the fluoride electrode against the reference electrode is a logarithmic function of the fluoride ion concentration in the solution, if the measurements are carried out in a buffer solution in order to avoid variations in the pH and the ionic strength in the solution and to unbind fluoride of complexing ions. The fluoride ion concentration is measured potentiometrically during the sampling period of 24 hr. In this way it is possible to determine 24-hour averages of the atmospheric HF concentration and within this period short-term averages can be measured. The monitor can measure HF concentrations in the range 0.05-15 micrograms/cu m. The calibration and testing of the device are described. The technique can be used to measue HF in stack gases by shortening the cycle period and can also measure sulfide, chloride, cyanide, and ammonia if a suitable ion selective electrode and sampling solution is used.

47921 **APTIC NO. 69554**

Komatsu, Sumio, Toshiaki Nomura, Toshio Nakamura, and Hisao Suzuki

A NEW ABSORPTION SPECTROPHOTOMETRY QUANTITATION OF AMMONIUM ION BY METHYL TIMOR BLUE MERCURY (II) SALT. *(Mechiru chimoru buru suigin (II) en ni yoru anmoniumu ion so shinkyuko kodo teiryo). Text in Japanese. Nippon Kagaku Zasshi (J. Chem. Soc. Japan), 91(9):865-868, 1970. 13 refs.*

A new method of absorption photometry measurement of ammonium ion was successfully devised by measuring the increase of absorption that occurs when methyl timor blue mercury II complex (blue green) reacts with ammonium ion and forms a mixed coordinate complex (blue-indigo). The solution of ammonium ion is adjusted to pH 7.5, and is mixed with mercury nitrate solution of 0.001 mol/l and MTB solution (each 10 ml) and the total volume is diluted to 50 ml by water. Two min later the blank solution of the reagent is used as a control and absorption is measured at 610 millimicron. Within the concentration boundary of 0-55 micrograms/50 ml of ammonium ion the calibration line is straight; but when the concentration increases, a curve is formed. The mol absorption coefficient is 5840 and the variation coefficient is 1.1% (ammonium ion 72 microgram) and 0.99% (144 microgram), and the reliability is good. The main interfering metal ions and nickel (II), manganese (II), iron (III), copper (II), and silver (I), and interfering anions are chlorine, cyanogen, and thiocyanic acid ion. By using ammonium distillation or anion exchange resin all the interferences can be eliminated. The method is simple, quick, and is applicable to the photometric quantitation of ammonium ion.

47922 **APTIC NO. 67758**

Malikov, V. V., B. I. Myagkov, A. A. Rusanov, and S. S. Yankovskiy

DETERMINATION OF THE EXTENT OF DISPERSION OF SULFURIC ACID MIST. *(Opredeleniye dispersnosti tumanov sernoy kisloty). Text in Russian. Khim. Prom. (Moscow), 46(5):365-366, 1970. 2 refs.*

An eight-state cascade impactor suitable for insertion in pipe connections with 56 mm inside diameter for the determination of the granulometric composition of sulfuric acid mist is described. The condensation of water vapor and sedimentation of particles in the sampling tubes is avoided by direct insertion into the gas duct. The first seven stages separate particles by inertia, while the filtration principle is applied to the last stage. The respective stages separate particles larger than 27 micron, 14 micron, 9.5 micron, 5.2 micron, 3.3 micron, 2.4 micron, 1.1 micron, and smaller than 1.1 micron, respectively, with the sampling rate being 10 l/min. It is possible to lower the upper separation limit by increasing the sampling flow rate. The quantitative determination of the individual fractions is possible by titration. At an initial sulfuric acid mist concentration of 65 g/cu m, the concentration measured after the last stage was 0.005 g/cu m.

47923 **APTIC NO. 69530**

Reagan, J. A. and W. P. Webster

A BISTATIC LIDAR FOR MEASURING ATMOSPHERIC AEROSOL DISTRIBUTIONS. *Preprint, Arizona Univ., Tucson, Engineering Experiment Station, 36p., 1970. 16 refs. (Presented at the Conference on Laser Radar Studies of the Atmosphere, 3rd, Ocho Rios, Jamaica, Sept. 9-11, 1970.)*

The interesting features of a unique bistatic-monostatic lidar system for studying tropospheric aerosols by laser light scattering measurements are described. The system provides the capability for making measurements of the intensity and polarization of angularly scattered laser light in addition to making simultaneous backscattered intensity measurements. System components of interest which are discussed include the transmitter-receiver assemblies, the bistatic receiver elliptical polarimeter, and the bistatic analog-to-digital converter data acquisition system. The practical problems associated with making bistatic lidar measurements which provide useful information about the size and height distributions of atmospheric aerosols are discussed. Particular problems of interest considered include the problems of separating the aerosol and molecular scattering contributions, compensating for the volume scattering geometry, and removing the path attenuation factors. Theoretical and experimental results related to the problems of receiver calibration, scattering volume corrections, and laser energy measurements are presented. Preliminary aerosol scattering measurements are also included. The bistatic lidar equation, the Stokes parameter formulation, laser transmitter optics, the monostatic and receiver systems, the data acquisition systems, and calibration methods are also discussed. (Author abstract modified)

47924 **APTIC NO. 67116**

Sawicki, Eugene

ANALYSIS FOR AEROTOXICANTS. *CRC Critical Rev. Anal. Chem., 1(3):275-333, Nov. 1970. 565 refs.*

Analytical methods are reviewed for a variety of aerotoxicants. Toxic compounds considered include: carcinogenic polynuclear hydrocarbons (arenes, aza arenes, and imino arenes); cocarcinogens such as certain alkanes and phenols; polynuclear anticarcinogens; respiratory irritants such as benzene, acetyl peroxide, formic acid, 2-methylbutene-2, 2-methylpentane, peracetic acid, and propylene oxide; allergens of the protein and glycoprotein type, including pollens; coallergens and antiallergens; mutagenic and/or carcinogenic alkylating agents; lachrymators such as formaldehyde, acrolein, and peroxyacyl nitrates; and phytotoxicants such as ethylene, sulfur dioxide, ozone, oxidants, and fluorides. Analytical methods cited include: electrochemical techniques, chromatography, colorimetry, spectrophotometry, fluorescence techniques, various spectrometric methods including mass spectrometry, and histamine bioassay tecniques (for allergens).

1969

47925 **APTIC NO. 69531**

Vengerskaya, K. Y.

DETERMINATION OF SMALL AMOUNTS OF MOLYBDENUM AND ITS COMPOUNDS IN THE AIR. *(Opredeleniye malykh kolichestv molibdena i yego soydineniy v vozdukhe). Text in Russian. In: Novyye Oblasti Promyshlenno-Sanitarnoy Khimii 1969. S.I. Murav eva (ed.), Moscow, Meditsina Publishing House, 1969, p. 195-196. 2 refs.*

The determination of small amounts of molydenum and its compounds in the air is described. The air is passed through filters made of paper or chlorinated polyvinyl chloride fiber at a flow rate of 8-10 l/min. The filters are carefully burned in a furnace at 400-500 degrees, and the residue is dissolved in dilute sulfuric acid. An aliquot of 5 ml of the solution is placed in a colorimetric test tube and 1 ml of 1% solution of PhNHNH2 is added. The mixture is heated in a water bath for 15 min and compared with standards prepared from known amounts of (NH4) 2MoO4. If methyl violet is the color forming reagent, the pH of the Mo-containing solution must be adusted to 2-2.5 before the addition of 0.5 ml of 0.01% solution of methyl violet. The sensitivity is 0.5 to 1 microgram Mo/ml.

47926 **APTIC NO. 69948**

White, R. A.

A PORTABLE INSTRUMENT FOR MONITORING METALLIC FUME. *Int. Conf. Air Pollut. Water Conserv., Proc., Basel, Switzerland, 1969, p. 93-100. 1 ref.*

A method of measuring metal fume concentration directly and immediately for use in monitoring fumes from the nonferrous metal industry is described. It can be used to measure cadmium and lead at their accepted respective threshold limits of 0.1 and 0.2 mg/cu m. The portable instrument consists of an atomic absorption spectrophotometer built directly into an air sampler. The instrument is described, its use in several applications is discussed, and future developments for the instrument are reviewed.

1965

47927 **APTIC NO. 75024**

Guichard, J. C.

MATRIX METHOD FOR GRANULOMETRY: MATHEMATICAL BASES. *(Methode matricielle de la granulometri bases mathematiques). National Inst. of Applied Chemical Research, Vert-le-Petit (France), Rept. 12-1965, 52p., July 30, 1965. 7 refs. Translated from French, 62p.*

The mathematical basis for studying granulometry is described. Granulometry is a branch of physics dealing with measurement of the size of grains in various solid states such as powders and aerosols or liquid states such as droplets. The matrix method for granulometry is described. It will be up to specific investigators to decide whether this procedure offers new prospects and to expand it for special applications. Granulometric problems can be examined in terms of matrix algebra which furnishes a means of examining many longstanding problems and a means of providing new incentive for original research in a number of fields.

1960

47928 **APTIC NO. 75044**

Hesse, Gerhard and Guenther Roscher

THE SELECTION OF CHROMATOGRAPHIC FLUIDS FOR ALUMINUM OXIDE OF KNOWN ACTIVITY. *(Die Abstimmung chromatographischer Fliessmittel auf Aluminumoxide eingestellter Aktivitaet). Erlangen-Nuernberg Univ. (West Germany), Inst. fuer organische Chemie, 1960 (?). 11 refs. Translated from German, 11p.*

Aluminum oxide containing a certain amount of water transfers the water in part to organic solvents, thus changing its activity. Serious interference in chromatographic column separations can arise from that fact. The interference can be prevented by the use of solvents with an adjusted water content. This technique and the use of active aluminum oxide for desiccation of pyridine are discussed.

AIR QUALITY MEASUREMENTS

1975

47929 **APTIC NO. 70071**

Que Hee, Shane S., Ronald G. Sutherland, and Margaret Vetter

GLC ANALYSIS OF 2,4-D CONCENTRATIONS IN AIR SAMPLES FROM CENTRAL SASKATCHEWAN IN 1972. *Environ. Sci. Technol., 9(1):62-66, Jan. 1975. 7 refs.*

Levels of 2,4-D ((2,4-dichlorophenoxy)acetic acid) in the atmosphere of central Saskatchewan were estimated as butyl and octyl esters using a two-column gas-liquid chromatography technique, and then further characterized by chemical derivatization. Gas-liquid chromatography/mass spectrometry confirmed the presence of 2,4-D. Mean total daily levels of 2,4-D (as n-butyl ester) found for Saskatoon for 33 days were 600 ng/cu m of air, and for Naicam for 47 days, 142 ng/cu m air. Very little 2,4-D was detected at Rosetown. (Author abstract)

47930 **APTIC NO. 69949**

Volchok, H. L., L. Toonkel, and M. Schonberg

RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Health and Safety Laboratory Fallout Program. Quarterly Summary Report. Appendix. Atomic Energy Commission, New York, Health and Safety Lab., Rept. HASL-288, p. B-1 to B-10, B-123 to B-131, Jan. 1, 1975. 7 refs.*

NTIS: HASL-288 Appendix, UC-11

During a study of the spatial and temporal distribution of nuclear weapons debris and lead in the surface air, radionuclides and lead in the surface air at various locations were conducted. Gamma activity, manganese(54), iron(55), strontium(90), cadmium(109), cesium(144), plutonium(238), plutonium(239), strontium(89), zirconium(95), and cerium(141) were measured. Quality control and results are described. Stable lead concentrations in surface air at various locations for 1966-1974 are listed.

1974

47931 **APTIC NO. 69576**

Alkezweeny, A. J.

CHARACTERISTICS OF AEROSOLS FROM ST. LOUIS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 94-99, April 1974.*

NTIS: BNWL-1850 PT3

Aircraft measurements at 1500-5500 ft altitudes were made for aerosol particle size distributions over St. Louis. The concentrations of particles of all sizes generally decreased with an increase in altitude, and size distributions in the same location showed a considerable daily variation. The volume distribution measured with time peaked around 0600 hr for particles greater than 0.45 micron. Increases in particles less than 0.45 micron and in Aitken nuclei concentrations were observed at noon, reflecting the effect of photochemical reactions. A decrease in the concentration of Aitken nuclei with distance downwind of the city was associated with an increase in the concentrations of particles in the range of 0.3-1 micron. Ice nuclei measurements indicated that the city is a source of ice nuclei, though the specific sources of the nuclei were not determined. (Author abstract modified)

47932 **APTIC NO. 69577**

Alkezweeny, A. J.

PRELIMINARY IN-PLUME MEASUREMENTS NEAR CENTRALIA. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 100-101, April 1974.*

NTIS: BNWL-1850 PT3

Preliminary in-plume measurements were made aboard an aircraft over a steam-powered electric plant near Centralia, Washington. The flight path started upwind of the plume and ended about 15 mi downwind at a 1500 ft altitude. The concentration of aerosol particles in the size range of 0.3-1 micron was greater than 1 million particles/cu ft, the upper limit for the instrumentation used. The maximum concentration of nitrogen oxides was about 0.28 ppm. Comparison of the peaks in the concentrations of particles greater than 1 micron to the peak in the concentrations of Aitken nuclei showed ratios which were higher for the large particles, indicating coagulation of the Aitken nuclei. The experiment demonstrated the feasibility of conducting in-plume measurements for investigating the behavior of aerosol particles and trace gases emitted from stacks.

47933 **APTIC NO. 69579**

Alkezweeny, A. J.

VERTICAL PROFILES OF TRACE GASES IN ST. LOUIS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 105-107, April 1974. 4 refs.*

NTIS: BNWL-1850 PT3

Comparisons of airborne and ground measurements of nitrogen oxides and nitric oxide were made at St. Louis during the period July 30, to August 1, 1973. The concentration of NOx and NO were measured with a chemiluminescence monitor, and data were obtained during three flights. The concentrations of NOx and NO at 1000 ft were 0.041-0.045 ppm and 0.032-0.038 ppm, respectively, as compared to ground levels of

0.020-0.022 ppm and 0.008-0.010 ppm, respectively. The 1000 ft concentrations decreased with further increases in altitude. Concentrations in the afternoon were higher than in the morning for all altitudes. The significance of above-ground sources of these gases is reflected by the increased levels at 1000 ft as compared to ground level concentrations.

47934 **APTIC NO. 69585**

Appel, B. R., J. J. Wesolowski, and G. M. Hidy

ANALYSIS OF THE SULFATE AND NITRATE DATA FROM THE AEROSOL CHARACTERIZATION STUDY. AIHL REPORT NO. 166. *Preprint, California State Dept. of Health, Berkeley, Calif., Air and Industrial Hygiene Lab., 37p., June 1974. 23 refs.*

Data on particulate sulfate and nitrate are presented from an aerosol characterization study performed in the South Coast Basin of California. Nitrate and sulfate together often comprised more than 15% of the total aerosol mass in the Basin, with nitrite levels generally increasing in an eastward direction. Most of the particulate nitrate and sulfate appeared to exist as the ammonium salts. The mass median diameter for sulfate was 0.2-0.4 micron at both source-enriched and receptor sites; while the mass median diameter for nitrate was much more variable, ranging from 0.3-1.6 micron. The larger mean sizes for nitrate were measured at the westernmost sites of the Los Angeles Basin. Mechanistically, sulfate formation appeared to involve at least two independent processes, a photochemical smog related and a carbon-catalyzed oxidation. Nitrate formation was consistent with nitrogen dioxide-water reaction occurring in the gas or liquid phase during the morning and leading to relatively large particles. Small particle nitrate was more relatable to oxidation by ozone or hydroxyl radical in the afternoon. (Author summary modified)

47935 **APTIC NO. 69956**

Augustine, Frank Edward

AIRBORNE SAMPLING OF PARTICLES EMITTED TO THE ATMOSPHERE FROM KRAFT PAPER MILL PROCESSES AND THEIR CHARACTERIZATION BY ELECTRON MICROSCOPY. *Oregon State Univ., Corvallis, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-4189, 1974, 217p. 74 refs.*

Airborne sampling of particles emitted to the atmosphere from two kraft paper mills were collected at several points downwind of their stacks for size distribution studies and characterization by electron microscopy. The size distributions just downwind of the stacks were log normal and were characterized by two parameters, the count median size and the geometric standard deviation. The median size of the particle size distributions in the plumes decreased significantly up to a point some 1.5 to 2 mi downwind. Particle size distributions obtained at one plant when one stage of a two-stage precipitator was shut down indicated that particle sizes were about 25% larger than during normal operation. Micrographs indicated that the particles were more dense and more regular in shape. Chemical identification of at least nine separate particles was achieved. Both sodium sulfate decahydrate and calcium carbonate were found, with the former being crystallized on the filter surface as a dark smear and the latter appearing as a large flaky particle about 2-3 micron in size. At least five morphologically different types of particles were classified, and all five were correlated with kraft mill effluent. Some very large agglomerated particles over 20 micron in size were also found on filter samples, though these were not a significant proportion of the size distribution.

47936 **APTIC NO. 69634**

English, Thomas D., Jose M. Sune, Douglas I. Hammer,
Lawrence A. Truppi, Wave E. Culver, Richard C.
Dickerson, and Wilson B. Riggan

HUMAN EXPOSURE TO AIR POLLUTANTS IN FIVE ROCKY MOUNTAIN COMMUNITIES 1940-1970. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, EPA-650/1-74-004, p. 3-3 to 3-17, May 1974. 22 refs.*

NTIS: PB 234 920/AS

A graphic summary of the estimated annual concentrations of total suspended particulates for Anaconda, East Helena, and Kellogg in the Rocky Mountains for 1940-1970 is given. In general, Anaconda was characterized by total suspended particulate levels below the national primary air quality standard of 75 micrograms/cu m; the levels in East Helena and Kellogg tended to be considerably above this value. In the 40s, total suspended particulates in East Helena averaged 278 micrograms/cu m. The weighted average of 340 total suspended particulate samples taken at four stations in Bozeman during 1967-1968 was 50 micrograms/cu m, which was used as an estimate of total suspended particulates (TSP) during the 1940-1970 period. The geometric means for Helena were 41-75 micrograms/cu m TSP. Both Anaconda and Kellogg experienced estimated sulfur dioxide concentrations in excess of the standard of 80 micrograms/cu m, while East Helena experienced concentrations consistently below this level. During the 50s, East Helena had an average SO2 concentration of 39 micrograms/cu m, compared to 353 micrograms/cu m for Kellogg. In 1967, Bozeman had 10 micrograms/cu m SO2/; in Helena, levels were 26 micrograms/cu m in 1967 and 1969. During the 60s, Anaconda and East Helena had similar annual suspended sulfate exposure, while Kellogg had higher exposures. The average 1967-1968 concentrations for Bozeman were 3.3 micrograms/cu m for suspended sulfates. A similar weighted average for Helena during 1966-1967 was 4.9 micrograms/cu m. Since the estimated SO2 concentrations in Anaconda and Kellogg were so much higher than in other communities, these communities are referred to as High I and High II. Bozeman, Helena, and East Helena are referred to, respectively, as Low I, and Low II, and Low III. (Author summary modified)

47937 **APTIC NO. 69640**

English, Thomas D., Walter B. Steen, Robert G. Ireson, Peggy
B. Ramsey, Robert M. Burton, and L. Thomas Heiderscheit

HUMAN EXPOSURE TO AIR POLLUTION IN SELECTED NEW YORK METROPOLITAN COMMUNITIES, 1944-1971. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, EPA-650/1-74-004, p. 5-3 to 5-32, May 1974. 9 refs.*

NTIS: PB 234 920/AS

Data from the New York City Dept. of Air Resources and from the Community Health and Environmental Surveillance System (CHESS) program were used to provide a comprehensive data base that is representative of historical air quality in the New York City metropolitan area. Pollutant levels for selected time periods are summarized. Collection methods were compared for equivalency and correlation. Where data were not available, estimates were made based on the best available information. The data show a consistent improvement in air quality for all pollutants considered. Monthly sulfur dioxide concentrations followed a cyclic pattern, with peak concentrations occurring in January. No such pattern was exhibited for total suspended particulates, respirable suspended particulates, or suspended sulfates. Pollutant measurement methods, survey methods, and precision of measurements are discussed. Concentration data is given for SO2, total suspended particulates, nitrogen dioxide, suspended sulfates, suspended nitrates, coefficient of haze, dust fall, cadmium, zinc, and lead. (Author summary modified)

47938 **APTIC NO. 65200**

Faoro, Robert

TRENDS IN CONCENTRATIONS OF BENZENE-SOLUBLE SUSPENDED PARTICULATE FRACTION AND BENZO(A)PYRENE DETERMINED BY DATA FROM THE NATIONAL AIR SURVEILLANCE NETWORK. *Preprint. Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1974. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-39.)*

National trends in the benzene-soluble portion (BSO) of total suspended particulate matter in ambient air for 1960 through 1970 is presented. Trends for benzo(a)pyrene (BaP), a polynuclear aromatic hydrocarbon (PAH) present as a component of the BSO fraction, are presented for 1966 through 1970. Currently, data are not available for other PAH compounds and organics making up the remainder of BSO. Ambient concentrations of BSO decreased significantly nationwide for urban stations from 1960 to 1970. Out of 126 urban stations studied, 118 exhibited negative-rank correlations with time, indicating the tendency at these stations of a decreasing trend in BSO concentrations. At half of the stations studied BSO showed a statistically significant downward trend. Decreases in urban BaP concentrations were also observed, but, the limited data available prohibit a statistical evaluation of this change. The composite BaP average of the 32 urban stations dropped about 30% from 1966 to 1970. Nonurban BSO and BaP tend to show a decrease at the majority of stations studied from 1966 through 1970. The estimated national consumption of coal by small consumers for heating purposes decreased approximately 50% in the 1966-70 period, and this decreased use during this period is probably the principal factor contributing to the trends in BSO and BaP. A similar percentage decrease was observed in composite average BSO concentrations for urban stations. Local open burning ordinances and controls on automboiles instituted during this period are other possible factors contributing to the observed trends for these suspended particles. (Author abstract)

47939 **APTIC NO. 70181**

Fontanella, Jean-Claude, Andre Girard, Louis Gramont, and Nicole Louisnard

ANALYSIS OF THE STRATOSPHERIC SPECTRA OF NO AND NO2. *(Analyse de spectres stratospheriques de NO et de NO2). Text in French. C. R. Hebd. Seances Acad. Sci., Ser. B., 278(5):181-184, Jan. 1974. 5 refs.*

The absorption spectra of nitric oxide and nitrogen dioxide were measured in the stratosphere at 15.5 km altitude shortly after sunrise and shortly before sunset by means of instruments on board of Concorde 001. Horizontally, the integrated quantity of NO amounted to 50 times 10 to the 15th power + or - 20 times 10 to the 15th power molecules/sq cm in the morning, and to 60 times 10 to the 15th power + or - 20 times 10 to the 15th power molecules/sq cm in the evening. The upper limit of the density was determined tentatively to be 1 billion molecules/cu cm. The local density of 800 million + or - 200 million molecules/cu cm was determined for NO2.

47940 **APTIC NO. 69757**

Gatayama, Tetsuya, Masayoshi Okamoto, Takeo Funabashi, and Hiromi Yoshida

THE RELATIONSHIP BETWEEN NON-METHANE HYDROCARBONS AND OZONE IN AMBIENT AIR. *(Taiki-chu no ozon nodo to hi metankei tankasuiso nodo tono kanrensei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):162, Nov. 1974. 1 ref. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 15.)*

Typical measurements of atmospheric hydrocarbons and ozone concentrations in the kawasaki area during December and May are reported and the correlation factors between the two levels are obtained. In May, an increased non-methane hydrocarbon level during the daytime and an increased ozone level at night were often observed. In both December and May, the concentration of hydrocarbons are linearly related to the number of automobiles. The correlation factors between two levels are negative for December (-0.12 to -0.18) and positive for May (0.50 to 0.59).

47941 **APTIC NO. 70245**

Georgii, H. W.

TRAFFIC-FREE SUNDAYS: NEW INSIGHT INTO THE SOURCES OF AIR POLLUTION. *(Verkehrsfreie Sonntage: Neue Einblicke in die Quellen der Luftverschmutzung). Text in German. Umschau Wiss. Tech., 74(22):715-716, 1974. 3 refs.*

Measurements of air pollutants taken in Frankfurt during the traffic-free Sundays in December 1973 are compared with the immission situation on normal Sundays. A comparison of the CO concentration on four Sundays in November/December 1972 with four traffic-free Sundays in 1973 yielded following concentrations in the center of Frankfurt/Main: 6.5 ppm CO in 1972, and 3.2 ppm CO in 1973. The results reveal the contribution of automobile exhaust gases to the total concentration of CO, nitric oxide, lead, and iron aerosols found in the city air. They demonstrate convincingly that the automobile is practically the only source for certain pollutants.

47942 **APTIC NO. 67036**

Giauque, R. D., L. Y. Goda, and N. E. Brown

CHARACTERIZATION OF AEROSOLS IN CALIFORNIA BY X-RAY FLUORESCENCE ANALYSIS. *In: Nuclear Chemistry Annual Report 1973. California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission Contract W-7404-eng-48, Rept. TID-4500- R61, UC-4 Chemistry, p. 409-410, 1974. 2 refs.*

NTIS: LBL-2366

X-ray induced X-ray fluorescence is used to characterize aerosols in the Fresno, California area, with emphasis being placed on particles smaller than 1 micron since these degrade visibility and are efficiently trapped in the human respiratory system. Diurnal patterns are illustrated for lead, bromine, iron, calcium, potassium, titanium, manganese, zinc, and chromium and show that approximately 75% of the Pb and Br are present in the less than 0.5 micron range. Diurnal patterns for K, Ti, Mn, and Fe are very similar to the total filter pattern; these elements are most likely produced by a mechanical process such as windblown soil dust. Calcium is present almost entirely in the larger particles and is probably from a mixture of soil and cement particles. Over half of the Zn measured is present in the less than 0.5 micron particle size range and is perhaps due to combustion sources, possibly from incineration of tires or tin cans. The Pb and Br constituents measured are probably from automotive emissions, with the Pb/Br ratio indicating that Pb is from an aged aerosol.

47943 **APTIC NO. 69712**

Gorchakov, G. I. and A. A. Isakov

THE AUREOLE HAZE SCATTERING FUNCTIONS. *(Oreol nyye indikatrisy dymki). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 10(5):504-511, May 1974. 17 refs.*

Results of systematic measurements of the angular dependence of the coefficient of oriented aureole haze scattering over the angle range of 24 min to 3 deg are presented. The scattering indices ranged from 0.03/km/stere in thin haze to 10/km/stere in thick haze. During the spring measurement series, indices with pronounced aureole were observed, which is indicative of the presence of a particle fraction with very homogeneous size distribution (pollen) in the atmosphere. The coefficients of oriented light scattering sometimes reached values of up to 100/km/stere. There was a fairly high correlation between the mean indices for 3 deg and for the range of

36 min - 2.5 deg. The correlation decreased for 3 deg and for angles smaller than 1 deg. The indices were highest at high relative humidity contents up to 95%.

47944 **APTIC NO. 65516**

Grosjean, Daniel and Sheldon K. Friedlander

GAS-PARTICLE DISTRIBUTION FACTORS FOR ORGANIC POLLUTANTS IN THE LOS ANGELES ATMOSPHERE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 26 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-154.)*

The distribution of organic pollutants between the gas and aerosol phases was measured on six different days in Pasadena. The measurements include: continuous monitoring of gas phase ozone, nitrogen oxides, sulfur dioxide, carbon monoxide, hydrocarbons, and light scattering; 1-hour high volume filter samples of particulates and removal of the organics by solvent extraction; organic carbon determination of both organic and water extracts using a carbon analyzer; and chemical analysis of particulates by fractionation, gas chromatography, infrared, and CHON analysis. Hourly samples of total particulates and organic carbon fractions were obtained for smog conditions varying from light to the heaviest level observed in Pasadena in 1973. The organic fraction was always large (average 30-40% by weight) reaching up to 60% of the total. Carbon content varied from 67% for the polar to 85% for the non-polar fractions. Non-polar organics were preponderant in morning samples and correlated well with gas phase hydrocarbons, while polar organics were preponderant in afternoon samples and correlated well with O3 concentration. Two conversion processes are involved: non-photochemical conversion of auto exhaust hydrocarbons and oxygenates associated with morning traffic and conversion of gas phase products of O3-hydrocarbons-NO2 photochemical reactions. (Author abstract modified)

47945 **APTIC NO. 69630**

Hertz, Marvin B., Lawrence A. Truppi, Thomas D. English, G. Wayne Sovocool, Robert M. Burton, L. Thomas Heiderscheit, and David O. Hinton

HUMAN EXPOSURE TO AIR POLLUTANTS IN SALT LAKE BASIN COMMUNITIES, 1940-1971. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N.C., National Environmental Research Center, EPA-650/1-74-004, p. 2-3 to 2-39, May 1974. 16 refs.*

NTIS: PB 234 920/AS

The position of the Community Health and Environmental Surveillance System (CHESS) communities in the Salt Lake Basin relative to the major copper smelter and the local meteorological pattern provided an area gradient of exposure to sulfur oxides. The exposures decreased with distance from the point source. The amount of exposure in different communities was determined. The city of Magna, Utah, located close to the smelter, had high exposure to SOx. Although the prevailing winds transported source emissions away from Magna most of the time, concentrations exceeded the primary air quality standard for sulfur dioxide of 80 micrograms/cu m during more than 75% of the past 32 yr on an annual basis. Increased use of SOx by the copper smelter for the manufacture of sulfuric acid and installation of control devices reduced emissions and ambient air concentrations of SO2 at Magna. Kearns, Salt Lake City, and Ogden, Utah, in that order, yielded a descending exposure gradient to SOx. Magna and Kearns experienced a greater frequency of short-term high concentrations of SO2 since they were closer to the smelter. Correlations between SO2 and suspended sulfates were higher in Magna and Kearns than in Salt Lake City and Ogden. Air quality measurements made in the Utah CHESS residential areas in 1971 did not exceed the national air quality standards. The CHESS air monitoring sites were purposely located close to the population under study and therefore represented average exposure of the neighborhoods. Estimates of past exposures to SO2 dating to 1940 were derived on the basis of annual smelter emissions. These estimates indicated that exposures were about 120% higher in the 1950s than current levels. Although past exposure estimates are crude, they do offer some guidance in determining past human exposure to air pollutants. Annual, daily, and monthly concentrations, interrelationships among pollutants, and long-term exposure trends are discussed. (Author summary modified)

47946 **APTIC NO. 69739**

Hirai, Eiji, Masaki Shako, and Rieko Nakamura

STATISTICAL ANALYSIS OF SULFUR OXIDES IN THE AIR. *(Taikichu no io sankabutsu nado no tokeiteki kaiseki). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 119-122, 1974. 3 refs. (Presented at the Symposium on Systems Engineering for Environmental Control, Toyama, Japan, July 18, 1974.)*

Results of sulfur dioxide measurement in Kanazawa city from 1966 to 1972 revealed that after a peak in 1969, the concentration decreased gradually. The particulate concentration has been decreasing since 1967. The correlation coefficient between the two pollutants was 0.844. The average SO2 concentration in Kanazawa was high compared to that of Osaka and Kobe. In the case of Kobe, the standard error became very significant when average concentration was higher than 0.03 ppm, indicating a frequent occurrence of high degree of air pollution. Mizushima showed a higher standard error compared to Osaka and Kanazawa even at low concentration. Results of analysis indicated that standard error is greatly affected by land shape, especially when high hills exist in the background. In that case, the chances of high air pollution become remarkably high. Data of Kanazawa and Osaka were well organized and suitable for simulation study.

47947 **APTIC NO. 69440**

Hofmann, D. J., J. M. Rosen, T. J. Pepin, and J. L. Kroening

GLOBAL MONITORING OF STRATOSPHERIC AEROSOL, OZONE, AND WATER VAPOR (PROGRESS REPORT). *Wyoming Univ., Laramie, Dept. of Physics and Astronomy and Minnesota Univ., Duluth, Dept. of Physics, Office of Naval Research Contract N00014-70-A-0266-0005, Rept. GM-19, 28p. April 1974.*

The latitude cross-sections of aerosols, ozone, and potential temperature derived from previously reported soundings are presented. The aerosol, O3, and water vapor concentrations in the stratosphere are monitored on a global basis for balloon-borne sensors in these areas: Ice Island, Barrow, McMurray, Duluth, Laramie, Palestine, Panama, Longreach, Mildura, and the South Pole. The aerosol cross-sections are presented in terms of constant mixing ratio of .3 micron diameter particles in units of number/mg. The O3 cross sections are presented in terms of constant mixing ratio with units of micrograms/gram. The potential temperature is presented in degrees Kelvin.

47948 **APTIC NO. 69719**

Hoshikawa, Hidehiko, Koji Abe, and Toshihiko Seki

INVESTIGATION AND STUDY OF AIR POLLUTION (REPORT NO. 11): THE SETTLING PARTICLE AND SULFUR OXIDE MEASUREMENTS IN SENDAI. *(Taiki osen ni kansuru chosa kenkyu (dai 11-ho), Sendai-shi ni okeru Showa 47-nen no koka baijin oyobi io sankabutsuryo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 4:65-67, Oct. 1974.*

A continuous monitoring of settling particles and sulfur oxides was conducted in Sendai, and the results between January and December 1972 are presented. The total average of settling particles for two representative areas of the city was 4.65 tons/sq km/mo, and was about 10% less thanthe previous year. The localized averages at the two locations were 6.65 and

2.264 tons respectively, showing about a 10% decrease. At one of the monitoring stations in the commercial area, the maximum was 11.7 tons in Feb. and the minimum was 2.81 tons in September. Seasonally, the winter level of settling particles was about 1.7 times over that of the fall. The sulfur oxide concentration average was the highest in the industrial area of the city, and wa 0.38 mg/sulfur trioxide/100 sq cm/day; the level in the commercial area was 0.31 mg and 0.25 mg; it was 0.11 to 0.2 mg on the perimetero the city; and the level was 0.06-0.1 mg in the suburbs. Seasonally, the summer average was 0.22 mg and the winter average was 0.46 mg. The pollution patterns over the last 10 years showed that the quantity of dusts steadily decreased since the 1965 conversion of fuel from coal to petroleum, and the plateau seems to have been reached. The SOx concentration increased up to 1970, but a decrease of 35% was noted over 1971 and 1972. One of the reasons was probably the Air Pollution Control Law revision in Dec. 1970, which enforced the use of oil fuel containing less than 1.5% of sulfur for the u eof heating fuel in the city.

47949 **APTIC NO. 70089**

Imai, Toru, Tadao Suzuki, and Yasuo Sueyoshi

FIELD SURVEY BY MOBILE SMOG CHAMBER (IV). *(Idoshiki sumogu chanba ni yoru firudo sabei dai4-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):158, Nov. 1974. (Presented at the 15th National Air Pollutioon Research Conference, Chiba, Japan, Nov. 6-8, Nov. 1974. Paper 11.)*

A survey conducted by the Japan Automobile Research Inst. on oxidant, nitric oxide, nitrogen dioxide, and hydrocarbon levels for a highway in the Matsudo area, Chiba, is reported. A mobile smog chamber was used and gas chromatography was used for the gas analysis. Formation of oxidants was large when the ratio between total hydrocarbons and nitrogen oxides was small, but the oxidant level reached a nearly constant value (0.1 ppm) when the ratio was large. The average methane level was 1.56 ppm and methane was the predominant hydrocarbon found at night. The smog chamber experiments show that oxidant formation is governed by the initial non-methane concentration and the concentration ratio of nitrogen oxides and hydrocarbons. The influence of the decrease of hydrocarbon levels upon the ultraviolet radiation was about 60%. Of these, ethylene and propylene were completely diminished, but the losses of propane, acetylene, and benzene were very small.

47950 **APTIC NO. 69751**

Irie, Tatehisa and Susumu Yoshizawa

ON DUST POLLUTION IN UNDERGROUND ARCADES, ESPECIALLY ON THE PARTICLE SIZE DISTRIBUTION. *(Chikagai funjin osen, tokuni sono ryudo bunpu ni tsuite). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 397, 1974. 3 refs. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 527.)*

Airborne and precipitated dust pollution in underground arcades was investigated on the basis of particle size distribution during a five-hour period in January 1974 in the Ginza and Shinjuku districts in Tokyo. In general, airborne particulate matter and precipitated particulate matter differed in particle size distribution. Dust collection techniques, characteristics of the measurement devices, and evaluation methods, all contribute to difficulties in obtaining meaningful comparative values.

47951 **APTIC NO. 69861**

Ishizaka, Takashi and Kenji Isono

STUDIES ON THE CONSTITUENTS OF PARTICULATE MATTER IN THE ATMOSPHERE. *(Taikichu nifuyu suru ryushi no busshitsu sosei no kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):172, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 25.)*

The composition and concentration of airborne particulates are studied in industrial, mountain, and ocean areas. The analyses investigate water-soluble nitrogen compound contents, carbon contents, and concentrations of magnesium and calcium in particulates. In industrial areas, the concentration of particulate per volume air was 20 times higher than that in other areas, and more organic matters were found. The content of water-soluble compounds such as sulfate salts was highest in the industrial area. The analyses of magnesium and calcium indicated that the ocean area showed the largest magnesium content, and the greatest calcium content was found in the industrial area, while the mountainous area showed neither ion.

47952 **APTIC NO. 69868**

Ishizaka, Takashi

STUDIES ON AEROSOL MATERIALS AND THEIR ALTERATION IN POLLUTED AIR. *(Osen taikichu no earosoru no busshitsu to sono henshitsu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):173, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 26.)*

Elemental constituents of aerosols in industrial, mountain, and ocean areas are analyzed using an X-ray microanalyzer. Elemental analyses were made for the atmoic number 6 through 30. Aerosols in polluted air consisted of more elements than those found in the cleaner ocean atmosphere.

47953 **APTIC NO. 69744**

Itai, Kazuyoshi, Fumio Tsunoda, Shiro Sakurai, and Ekuko Aizawa

STUDIES ON AIR POLLUTION BY FLUORINATED COMPOUNDS (13): ON ATMOSPHERIC CONCENTRATIONS OF FLUORIDES IN VARIOUS PARTS OF THE COUNTRY. *(Fukkabutsu ni yoru taiki osen ni kansuru kenkyu (dai-13-ho): Honpo kakuchi ni okeru taikichu fukkabutsu nodo ni tsuite). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 416, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 546.)*

Fluoride concentrations were measured at a total of 52 sites, including residential areas and industrial areas. Near aluminum and steel factories and phosphate fertilizer plants, fluorides were mostly present as water-soluble particles. Near ceramic industries, gaseous fluorides were predominantly present. In metropolitan residential areas, fluorides were generally present in concentrations not exceeding 0.2 micrograms F/cu m. With some pollution sources it becomes necessary to measure water-soluble fluoride particulate concentrations in addition to atmospheric fluoride particulate determination as hydrogen fluoride in order to obtain the precise total fluoride pollution concentrations.

47954 **APTIC NO. 69839**

Ito, Nobuo, Kinji Nakano, Kunihiko Asakino, and Toshio Ohira

THE RELATION OF HYDROCARBONS AND NITROGEN OXIDES TO OXIDANTS. *(Oxidanto ni taisuru tanka suiso to chisso sankabutsu no kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):161, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 14.)*

The relationships among hydrocarbon, nitrogen oxide, and oxidant levels observed in Tokyo are discussed. For an oxidant level of 0.15 ppm, the maximum non-methane hydrocarbon level was 0.37 ppm, and 0.1 ppm oxidant gave a maximum hydrocarbon level of 0.23 ppm. At oxidant levels of 0.15 ppm and 0.1 ppm, the maximum nitrogen oxides levels wree 0.002 ppm and 0.0018 ppm, respectively. The relationship between hydrocarbons, nitrogen oxides, and oxidants was that a maximum at 0.35 ppm for hydrocarbons and 0.003 ppm for nitrogen oxides appeared when 0.1 ppm oxidants were present in the atmosphere.

47955 **APTIC NO. 69276**

Kaneshima, Kiyoshi and Tamotsu Omori

ENVIRONMENT OF OKINAWA AND LEAD POLLUTION. *(Okinawa no kankyo to enosen). Text in Japanese. Preprint, Geochemical Society of Japan, p. 64-65, 1974. (Presented at the Geochemical Society of Japan Study Meeting, Tokyo, Japan, Oct. 1-3, 1974.)*

The area used as a U. S. military base in Okinawa is 21.2% of the total island area. The lead pollution in Maki harbor from the waste oil and water from the U. S. base were investigated. The Pb concentrations measured in the immediate area of the sewer outlet were 12-68 ppb for sea water and 300-1560 ppm (average 898 ppm) for sea bed. The Pb concentration in the sea bed was 6-30 times higher than those in other harbors in Okinawa, and the concentration distribution indicated an increase (400-4000 ppm) in concentration with decrease in grain size (24-150 mesh). The Pb content in shellfish meat was 3.1-3.9 ppm, which was higher than that of the same types of shellfish in other harbors (0.9-2.0 ppm). The Pb content in shells was 3.3-8.9 ppm compared to 1.6-2.3 ppm in shells of the other harbors. A definite correlation was found between the Pb contents in meat and shells. The Pb content in coral reefs collected inside the harbor was 2.7-3.0 ppm compared to 1.8-2.1 ppm for samples collected outside of the harbor. The atmospheric pollution due to automotive exhaust gas was as high as that in major cities such as Tokyo and Osaka, and Pb concentration measured on Nov. 17-18, 1973 was 1.08-1.00 micrograms/cu m. Also, high Pb concentration was found in a river bed in the area.

47956 **APTIC NO. 65199**

Levaggi, D. A., J. S. Sandberg, M. Feldstein, and SuzAnne Twiss

TOTAL ANTHROPOGENIC SUSPENDED PARTICULATE AS DERIVED FROM CHEMICAL ANALYSIS OF CHLORIDE AND SILICATE ON HIGH-VOLUME SAMPLES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-34.)*

Extensive chemical analysis of suspended particulate undertaken by the Bay Area Air Pollution Control District for interpretation of total mass leading data and the detection of problem areas is presented. From high-volume samples taken with cellulose paper as the collection medium, analyses were performed for the five heavy metals and nitrate, sulfate, chloride, silicon, and total organics (loss on ignition at 550 C). Two constituents considered primarily non-anthropogenic, silicate and chloride, were evaluated from eight sampling sites. Data were derived from over 600 samples, one sample per week per site. The locations have diverse geographical backgrounds, although they lie in a common air basin. A 21-month average for chlorides ranged from 4.2 micrograms /cm m at San Francisco to 1.7 micrograms/cu m at Livermore some 40 miles inland. Inversely, the total silicates increased from 5.7 micrograms/cu m at San Francisco to 22.6 micrograms/cu m at Livermore. The silicate values peak strongly in the dry season, with individual 24-hour silicate component values greater than 60 micrograms/cu m at inland stations. Wind-generated dust from the bare hills of the Coast Range is the most probable source. Since the silicates and chlorides are primarily non-anthropogenic, they were excluded from the TSP values to give a total anthropogenic suspended particulates (TASP). The TASP values for the Bay Area show a geographic distribution in much closer conformity to visibility reduction and citizen complaint than do TSP values. (Author abstract)

47957 **APTIC NO. 65161**

Marushige, Yoshiteru, Tomoo Kido, and Masami Watanabe

AIR POLLUTION AND THE TRAFFIC FLOW-OBSERVATION OF A UNIT TRAFFIC. *(Taiki osen to kotsuryu ni tsuite-tanrobu ni okeru ichikansoku kekka). Text in Japanese. Kagaku Keisatsu Kenkyusho Hokoku (Rep. Natl. Res. Inst. Police Sci.), 15(1):71-77, March 1974. 5 refs.*

Localized air pollution due to automobile exhaust gas was surveyed by measuring the traffic flow (traffic volume, speed, and density) of unit traffic along with carbon monoxide, nitric oxide, and nitrogen dioxide concentrations at roadside and at the background area. The relationshp between the traffic flow and pollutant concentration was analyzed taking meteorological factors into account. The traffic was not generally congested and more than 90% consisted of passenger cars. The traffic volume was 27-504 cars/15 min, the traffic speed was 44-58 km/hr, and the average density was 0.08-1.82 cars/40 m. The CO and NO concentrations were in the range of 0.4-7.0 ppm and 0.1-3.4 ppm, respectively. The weather was partially clear with northeasterly wind at 0.2-2.0 m/sec. The hourly variation pattern in CO and NO concentrations was similar to the variation in traffic flow (traffic volume and density), however, the NO2 concentration showed different patterns. The correlation between CO or NO concentration obtained by substracting the atmospheric concentration from the measured value and traffic density (K) was far more significant than the correlation between the measured value and traffic density. When the effect of wind velocity (U) is taken into account, the correlation coefficient r equals 0.73 for CO-K/U and r equals 0.72 for NO-K/U. If U is equal to or higher than 1 then r equals 0.90 for CO and r equals 0.75 for NO. When the wind direction, wind velocity, and atmospheric concentration are taken into account, a fairly definite correlation can be found between traffic flow (represented by traffic density) and pollutant concentration.

47958 **APTIC NO. 68443**

Matsuo, Kiyoko

AIR POLLUTION IN WAKAYAMA (REPORT NO. 7). *(Wakayama-shi no taiki osen ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):60, Feb. 1974.*

Part of the study on the visibility in Wakayama was presented in 1966. In this report, the yearly changes since the very beginning of visibility observations, the effects of pollution, and comparisons with visibilities of Osaka and Shinomisaki were discussed. The data since 1932-1933 were examined for every ten years, and taking minimum visibilities, monthly averages were calculated. When Shinomisaki is regarded as a natural, unpolluted environment, the deterioration curve for visibilities in Osaka and Wakayama, reaching the bottom in 1970, clearly shows the effects of pollution in both cities. The visibilities in these cities are less than 1/3 and 1/2, respectively, of that of Shinomisaki. The hourly measurements show that the visibility at Shinomisaki is the same for 9 am and 3 pm, but Osaka is the type that has the lowest visibility at 9 am and Wakayama is similar. The curves for yearly changes for visibility an/ that for sulfur dioxide concentration agree well, both reaching the worst peak in 1970. The ratio of the visibility monthly average to that of a sunny day is 96% in Osaka, 92% of the Wakayama, and 90% in Shinomisaki. The visibility in Osaka on Jan. 3, 1973 was unusually good, reaching an unprecedented 50 km, with the pollution level of 1/2 or 1/3 of ordinary measurements.

47959 **APTIC NO. 69659**

Mayrsohn, Henry, Mutsuo Kuramoto, James Crabtree, Ray D. Sothern, and Henry Mano

A TREND STUDY OF TWO INDICATOR HYDROCARBONS IN THE SOUTH COAST AIR BASIN. *California Air Resources Board, Div. of Technical Service, 11p., June 1974. 8 refs.*

Emissions of acetylene and isopentane were measured during the morning rush hour at two representative sites in the Los Angeles atmosphere. Acetylene, a specific indicator of automobile exhaust emissions, declined in the Los Angeles atmosphere at an average annual rate of about 12% since 1970. In downtown Los Angeles the concentration for 1973 was 39 ppb, and at a site 16 mi east at Azusa the concentration was 18 ppb. The rate of reduction is slightly greater than the auto exhaust hydrocarbon reduction rate called for by the California implementation plan and suggests that the exhaust emission reduction program is effective. Isopentane, an indicator of gasoline vapor and automobile exhaust emissions, is declining at a much slower rate. Concentrations in downtown Los Angeles in 1973 were 35 ppb compared to 19 ppb at Azusa. The trend suggests that gasoline spillage and vapor emissions are less well controlled and are assuming greater significance in the atmosphere. (Author summary modified)

47960 **APTIC NO. 65269**

Meyer, Edwin L., Jr.

METHODS FOR ESTIMATING EMISSIONS AND AIR QUALITY IN THE VICINITY OF INDIRECT SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1974. 15 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-146.)*

A methodology for estimating carbon monoxide emissions from indirect sources and for determining the impact of these emissions on peak and background concentrations of CO in the vicinity of the source is presented. Peak concentrations are assumed to occur in the vicinity of traffic lanes at exits to the source or at intersections on nearby access roads. Increases in background concentrations are assumed to be the result of increases in emission density arising from operation of the source. Emission density is a function of traffic volume demand flow, typical vehicle running time, CO emission factors, and the area occupied by the facility and its surrounding parking lots. A line source model was used to estimate maximum concentrations resulting from nearby traffic lanes. These estimates are superimposed on the background estimates to estimate maximum concentrations. As the demand to capacity ratio approaches unity, queues are likely to form, and the line source is regarded as a finite one composed of idling vehicles. If the demand to capacity ratio remains low, the line source is considered infinitely long and emission intensity is a function of traffic volume demand and operating speed. Key design and operating variables are identified for seven types of indirect sources. (Author abstract modified)

47961 **APTIC NO. 69862**

Mitsugi, Hirokatsu, Yoshihiro Nakagawa, and Tsunehiro Takada

CHEMICAL FORMS OF HEAVY METALS AT THE SOURCE AND IN ATMOSPHERIC DUSTS. *(Hasseigen oyobi kankyo ni okeru jukinzoku-to no kagakuteki keitai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):171, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 24.)*

Chemical compositions and crystal forms of chimney dust and airborne dust are studied by X-ray diffraction. Identification of metal species is made by either X-ray fluorescence or atomic absorption spectrometry. Dust emitted from steel plants was mainly alpha-ferric oxide or ferrosoferric oxide with some substitution of by manganese, nickel, chromium, or zinc ions at iron positions. The dust emitted from metallic furnaces at nonmetal industries contained copper, zinc, aluminum, and other metal oxides. In the airborne dust analysis, alpha-ferric oxide, calcium sulfate, silicon oxide, and sodium chloride were always found.

47962 **APTIC NO. 65517**

O Brien, Robert J., John R. Holmes, Robert J. Reynolds, John W. Remoy, and Albert H. Bockian

ANALYSIS OF PHOTOCHEMICAL AEROSOLS IN THE LOS ANGELES BASIN ACCORDING TO PARTICLE SIZE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1974. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-155.)*

The size distribution of some of the major anthropogenic constituents of atmospheric aerosol was investigated in the Los Angeles basin. A cascade impactor head operating on a standard high volume air sampler was utilized in conjunction with another high volume sampler without the size fractionator. Mass distribution data was obtained at four sites over a period of 7 mo in 1973. Samples were analyzed for nitrate and ammonium ions, sulfur, iron, lead, chlorine, bromine, and calcium, and for alcohol-soluble organic material. Prime emphasis was placed on separating and analyzing particles below 1.1 micron, but analyses were performed in other size ranges as well.

47963 **APTIC NO. 65542**

Ondov, John M., William H. Zoller, and Glen E. Gordon

TRACE ELEMENTS ON AEROSOLS FROM MOTOR VEHICLES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1974. 17 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-197.)*

Concentrations of 24 elements on particles collected on filters near an open highway and in a highway tunnel were measured by instrumental neutron and photon activation analysis. The relative concentrations of lead, bromine, chlorine, zinc, and barium on aerosols of appreciable atmospheric residence time from motor vehicles are 1.00, 0.33, 0.16, 0.012, and 0.010, respectively. Concentrations of many other elements such as aluminum, calcium, and iron rise near highways, but return to background values within a few hundred feet. Apparently these elements are present on very large particles that quickly settle to the ground near the highway. The Zn/Pb ratio of aerosols from motor vehicles is much too small to account for the Zn levels observed in large American cities. (Author abstract)

47964 **APTIC NO. 65197**

Paskind, Jack and John R. Kinosian

HYDROCARBON, OXIDES OF NITROGEN AND OXIDANT POLLUTANT RELATIONSHIPS IN THE ATMOSPHERE OVER CALIFORNIA CITIES. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 20p., 1974. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting 67th, Denver, Colo., June 9-13, 1974. Paper 74-31.)*

Air quality data are used to show relationships between oxidant, hydrocarbon, and oxides of nitrogen concentrations at Los Angeles, Azusa, and San Bernardino. Families of inverted parabolic curves show that maximum-hour oxidant levels decrease with decreasing 6-9 am hydrocarbon concentrations at each station. However, depending on the 6-9 am oxides of nitrogen concentration, an increase of the concentration of these gases may either increase or decrease oxidant concentration. Consequently, for any given 6-9 am concentrations of the precursors, hydrocarbons, and oxides of nitrogen, the oxidant concentrations generated are different at the three stations. Emissions of both hydrocarbons and oxides of nitrogen must be reduced to achieve lower oxidant concentrations in all areas of the South Coast Air Basin. Data is provided from air monitoring stations. (Author abstract modified)

47965 **APTIC NO. 69486**

Patterson, Ronald K. and Jack Wagman

MASS AND COMPOSITION OF AN URBAN AEROSOL AS A FUNCTION OF SIZE FOR SEVERAL VISIBILITY LEVELS. *Preprint, American Chemical Society, Washington, D. C., 6p., 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry Meeting, Los Angeles, Calif., April 1974.)*

Variations in aerosol mass, composition, and size distribution were compared to variations in visibility in an urban area. An integrating nephelometer was used to monitor visibility, and four sets of aerosol samples were taken during different visibility conditions in Secaucus, N. J., approximately 3 mi west of New York City between Sept. 29 and Oct. 10, 1970. Seven cascade impactors and three high-volume samplers were used to gather aerosol size data. Measurements of concentration as a function of particle size were made for total mass, sulfate, nitrate, chloride, ammonium, lead, iron, magnesium, and zinc from samples collected with the cascade impactors. Measurements of mass, carbon, hydrogen, and nitrogen were made from samples collected with high-volume samplers. Mass concentration increased as visibility decreased. Based on log probability plots, sulfate, ammonium, and lead all had mass median diameters equal to or below 0.5 micron, regardless of visibility level. The mass median diameters (MMD) for nitrate ranged from 0.03-1.34 micron, for chloride from 0.43-1.13 micron, for zinc from 0.87-1.61 micron, and for iron and magnesium 4 micron or above. Chemical composition was relatively consistent, especially through the three lower visibility levels. The mass distribution could not be adequately characterized by a single, log-normal distribution. The mass distribution was fitted to a bimodal distribution. As visibility decreased, the amount of mass below 2 micron increased and the MMD of the lower-sized mode decreased. Both effects increased the effective light scattering per unit mass.

47966 **APTIC NO. 67047**

Reay, J. S. S.

AIR POLLUTION MONITORING IN THE UNITED KINGDOM. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 5, p. 109-134. 4 refs.*

Air pollution monitoring in the United Kingdom is reviewed. Smoke and sulfur dioxide have been measured regularly by the National Survey. Smoke is measured by a reflectometer and sulfur dioxide is measured by oxidation to sulfuric acid and determined by titration. Survey site classification and selection, the role of the Central Laboratory, data analysis, trends of smoke and sulfur dioxide, grit and dust measurement methods, monitoring of other pollutants in the United Kingdom, air pollution modeling, and the choice of an air pollution surveillance or monitoring system are discussed.

47967 **APTIC NO. 65202**

Ripperton, L. A., J. B. Tommerdahl, and J. J. B. Worth

AIRBORNE OZONE MEASUREMENT STUDY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-42.)*

A study of high O3 (ozone) concentrations in non-urban areas of the Eastern United States using measurements made from an aircraft is presented. Planned flights followed a ground track from Raleigh, N. C. to Lewisburg, W. Va., Kane, Pa., Coshocton, Ohio and back to Raleigh. Ozone was measured with a solid phase chemiluminescent instrument. Data support the contention that the high O3 systems were widespread, although the areal extent of such systems were not determined. Some of the data showed that the O3 measured had its origin in the surface layer of air. Other data suggest a complex history of transport and chemistry for the high O3 concentrations. Although air pollution is undoubtedly responsible for the high O3 concentrations, the location of the pollution source could not be determined. (Author abstract modified)

47968 **APTIC NO. 67037**

Sciamanna, A. F. and A. S. Newton

A SURVEY OF THE OCCURRENCE OF DIMETHYL MERCURY IN THE ATMOSPHERE. *In: Nuclear Chemistry Annual Report 1973. California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission Contract W-7405-eng-48, Rept. TID-4500-R61, UC-4 Chemistry, p. 410-413, 1974. 2 refs.*

NTIS: LBL-2366

Atmospheric dimethyl mercury was sampled at land-based stations along the California coast using gas chromatography to establish a base line or natural background value for the compound near the ocean. Values ranged from less than 3.4 to 38 picograms/cu m of air and were somewhat lower than expected. A reading of 756 picograms/cu m of air obtained from inside a laboratory building was surprisingly higher than expected, considering a relatively high-flow air ventilation.

47969 **APTIC NO. 69698**

Shikano, Akira and Mitsu Sone

INVESTIGATION OF DISTRIBUTION OF AIR POLLUTANTS IN MIYAGI PREFECTURE BY AIR POLLUTANT MEASUREMENT CAR. *(Taiki osen kansokusha ni yoru miyagiken-nai taiki osen busshitsu no bunpuryo chosa). Text in Japanese. Miyagiken Kogai gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no 2:14-19, April 1974.*

Concentrations of sulfur dioxide, dust, nitrogen oxides, oxidants, and carbon monoxide in Miyagi Prefecture were measured at 19 places from May 1973 to February 1974. Four days were used for measurements of pollutants at each place. One-hour values of SO2 fell in the range of 0.015 to 0.030 ppm in most cases. Generally, SO2 concentration increased from the morning throughout the day and decreased at night unless there was a special SO2 emitting source near the measuring car. Dust concentration changed from place to place and day to day, and was influenced by wind velocity. The higher the wind velocity, the larger the dust concentration was. The maximum dust concentration reached 0.468 mg/sq m. Maximum nitric oxide concentration reached 0.035 ppm but the concentration was less than 0.01 ppm in most places and most periods of time. Nitrogen oxides concentration did not exceed 0.01 ppm at any place. The NO concentration became high twice a day, morning and evening, while nitrogen dioxide concentration reached a maximum in daytime but decreased at night. Averaged oxidants concentration fell in the range of 0.02 to 0.06 ppm at any place. The concentration change of oxidants was similar to the change of NO concentration. The CO concentration was generally very low and 2 ppm was the maximum. Since the environmental standard for CO was 10 ppm, there was no problem with CO concentration in Miyagi Prefecture.

47970 **APTIC NO. 69936**

Shum, Yin-Sang

ATMOSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING AIR POLLUTION. *Oregon State Univ., Corvallis, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-13,426, 1974, 204p. 67 refs.*

Neutron activation analyses of airborne trace elements in industrial and rural areas of western Oregon were performed to investigate the use of both natural and artificial tracer techniques for identifying various sources of pollution. Concentrations of trace elements detrimental to human health were also investigated. Among a multitude of trace elements correlated with particular industrial and non-industrial sources of pollution, only zirconium, hafnium, tantalum, and arsenic were useful as naturally occurring tracers. The potential toxic elements mercury, arsenic, selenium, and vanadium were emitted in concentrations too low for endangering human health. Comparative measurements in an industrial area and a rural area showed abnormally high trace element concentrations in the former area and very low concentrations in the latter. An artificial tracer technique using some of the rare-earth elements (dysprosium, samarium, lanthanum, and cerium) was developed to monitor industrial stack effluents. These tracers were used in testing the generalized Gaussian plume model and Hewson s trapping plume model applied to the dispersal pattern of stack effluents under various meteorological conditions. The models worked well under all but very turbulent conditions. Application of the meteorological models along with multiple regression analysis, using the artificial tracers as source references, to stack emission rates resulted in predictions within a factor of two for multiple sources involving three stacks. (Author conclusions modified)

47971 **APTIC NO. 69657**

Simeroth, Dean and Don Koeberlein

AIR QUALITY IN THE SAN DIEGO AIR BASIN. *California Air Resources Board, Div. of Technical Services, 33p., Aug.1974. 8 refs.*

Aspects of the San Diego Air Basin which affect air pollution and the sources and quantities of air pollutants emitted in the Basin are described. In 1972, 2372 tons/day of pollutants were emitted into the atmosphere. Motor vehicles were the largest source of organic gases, carbon monoxide, and oxides of nitrogen. In 1973, the oxidant standard of 0.08 ppm was exceeded many times at all San Diego stations. The 1-hour CO standard, 35 ppm, was not exceeded, but the 8-hour standard, 9 ppm, was exceeded at two stations. The 1-hour nitrogen dioxide standard, 0.25 ppm, was exceeded at one station. The Annual particulate standard, 60 micrograms/cu m geometric mean, and the 24-hour standard, 100 micrograms/cu m, were exceeded at all stations. Trends in oxidant concentration have declined slightly from 1968-1973, while CO, NO2, hydrocarbon levels, and carboxyhemoglobin remained constant. The highest concentrations of NO2, CO, hyrocarbons, suspended particulate matter, and particulate lead occur during the fall and winter months because of the stable atmosphere and light winds during these months. (Author summary modified)

47972 **APTIC NO. 65210**

Storey, Richard W., Jr., Ronald J. Sentell, David C. Woods, William C. Hulten, John R. Smith, and Franklin S. Harris, Jr.

PARTICULATE AIR QUALITY MEASUREMENTS IN NORFOLK, VIRGINIA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-59.)*

Air quality is measured with time-of-day resolution in terms of atmospheric mass loading, particle size distribution, and particulate elemental composition for a period of two weeks, in order to establish a mean level of air quality and deviations about this mean, ascertain diurnal changes or special events in air quality, and evaluate instrumentation and sampling schedules. Simultaneous measurements were made with the following instruments: Celesco model PM 39-D mass monitor, Royco model 220 light scattering particle counter, conventional Hi-vol sampler, and Nuclepore filters. To assess the impact of meteorological conditions on air quality variations, continuous data were recorded on temperature, relative humidity, wind speed, and wind direction. Particulate elemental composition was obtained from neutron activation and scanning electron microscopy analysis of Nuclepore filter samples. A review of the experimental data reveals consistent diurnal increases in atmospheric mass loading in the early morning. (Author abstract)

47973 **APTIC NO. 68342**

Takashima, T., H. S. Chen, and C. R. Nagaraja Rao

POLARIMETRIC INVESTIGATIONS OF THE TURBIDITY OF THE ATMOSPHERE OVER LOS ANGELES. *In: Planets, Stars, and Nebulae Studied with Photopolarimetry (XXIII Colloquium of the International Astronomical Union). T. Gehrels (ed.), Tucson, Ariz., University of Arizone Press, 1974, p. 500-509. 26 refs.*

An elementary interpretation of ground-based measurements of skylight polarization made at Los Angeles was attempted with the use of computed values of scattered radiation in a simple model of a turbid atmosphere. Measurements were made with a photoelectric polarimeter in four spectral intervals (bandwidth of 0.015 micron) centered on 0.362, 0.392, 0.500, and 0.590 micron. A multistream approximation was used to solve the radiative transfer problem in the three-layer model of a turbid atmosphere consisting of a concentrated aerosol layer between two molecular layers. Reasonable correspondence between theory and experiment was found. The experiments indicated that, in principle, systematic analysis of the correspondence between experiment and theory should yield information about effective values of atmospheric turbidity provided that suitable constraints can be imposed on the range of variability of model parameters such as the ground albedo, the aerosol type, and the aerosol optical thickness. (Author abstract modified)

47974 **APTIC NO. 69563**

Thomas, C. W.

ATMOSPHERIC NATURAL AEROSOLS AND FALLOUT PARTICULATES DURING 1973 AT RICHLAND, WASHINGTON AND POINT BARROW, ALASKA. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 20-24, April 1974.*

NTIS: BNWL-1850 PT3

Measurements of atmospheric natural aerosols and fallout particles at Richland, Washington and Point Barrow, Alaska are reported. The concentration of radionuclides associated with weapons testing decreased two- to tenfold during 1973 at Richland, Washington, reflecting the lack of high-yield weapons testing during 1971 and 1972. The atmospheric radionuclide concentrations for the period 1971-1973 decreased with a residence half-time of 11 mo, similar to that measured from 1963-1966. The time variations in the atmospheric concentrations of plutonium-238 and plutonium-239 at Richland and Point Barrow since 1964 were typical of nuclear weapons-produced radionuclides, except for the increase in Pu-238 concentration from 1965 to 1968 resulting from the burnup of a nuclear generator at 46 km altitude in the southern hemisphere. The Pu-238 concentration showed seasonal variation typical of radionuclides of stratospheric origin. Richland air filter samples collected during 1973 and analyzed for trace elements showed concentrations of nickel, zinc, arsenic, bromine, molybdenum, and lead which were characteristic of large contributions from sources other than the earth s crust. The bromine-to-lead ratio (0.15) was about what would be expected from automobile exhaust.

47975 **APTIC NO. 65224**

Tiao, G. C., G. E. P. Box, and W. J. Hamming

A STATISTICAL ANALYSIS OF THE LOS ANGELES AMBIENT CARBON MONOXIDE DATA. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 19p., 1974. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-77.)*

A statistical analysis of some aspects of the ambient carbon monoxide data from 1961 to 1972 recorded at seven appropriately distributed locations in the Los Angeles Basin is presented. Using modern time series methods and graphical techniques, an overall trend analysis of the movement of CO is given. Of special interest is a detailed study of the effect on the observed concentration level of CO due to a change in the method of calibration of the measuring instrument in April 1968 and various control measures introduced since 1966. Also presented is an analysis of the seasonal variation of CO and the diurnal variation on weekdays and weekends. The study is to assess the influence of meteorological variables on the concentration level of the pollutant. Appropriate mathematical models are developed which relate CO to inversion base height, wind speed, and traffic pattern. In addition, an analysis of the meteorological conditions during the days in which hourly concentration level of CO exceeded the California Air Quality Standard is given.

47976 **APTIC NO. 69750**

Tsuji, Kusuo, Manabu Muramatsu, Shigeo Okamoto, Sho Saito, Chikara Kikuchi, and Masahisa Omiya

STUDIES ON SUSPENDED DUSTS IN INDOOR AIR (4): ON TOTAL MERCURY IN AIRBORNE DUSTS. *(Shitsunai kukichu no fuyu funjin ni kansuru kenkyu (Dai-4-ho): Fuyu funkinchu no sosuigin ni tsuite). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 311, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 530.)*

The mercury concentration in indoor airborne particulates was determined and compared to mercury concentration outdoors. Samples were collected simultaneously indoors and outdoors at an office building in Tokyo, with a low-volume air sampler. Measurements were taken in July 1974, during 24-hour time periods divided into 8 working-day hours and 16 night-time hours. During the daytime hours, the average total Hg concentration in airborne dust indoors was 0.626 ng/cu m, and at night, 0.682 ng/cu m. Mercury concentration outdoors during the day was 0.780 ng/cu m, but at night, the concentration was 0.654 ng/cu m.

47977 **APTIC NO. 65206**

Wade, Willard A., III, William A. Cote, and John E. Yocom

A STUDY OF INDOOR AIR QUALITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1974. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-50.)*

An indoor/outdoor air sampling program was carried out for nitric oxide, nitrogen dioxide, and carbon monoxide in three private houses having gas stoves as part of a larger program to investigate indoor sources of air pollution. The three houses chosen for study represented different surrounding land use, life styles, house age, and layout. The pollutant gases were measured essentially simultaneously at three indoor locations and one outdoor location by single multiplexed NO-NO2 and CO instruments utilizing a TRC designed sample switching system. Indoor levels of NO and NO2 are directly related to stove use in the homes tested. These stoves often produced more NO2 than NO, and average levels of NO2 in the kitchen can exceed 100 micrograms/cu m. Indoor CO concentrations were influenced more by outdoor activities (automotive traffic) than by indoor sources. A diffusion experiment conducted in one of the houses showed that the half-life for NO2 was less than 1/3 that for either NO or CO. Oxidation of NO to NO2 (based upon comparing the half-life of NO to CO) does not appear to occur to a significant degree indoors. (Author abstract)

47978 **APTIC NO. 69619**

Willeke, Klaus and Kenneth T. Whitby

PHYSICAL CHARACTERISTICS OF DENVER-AREA AEROSOLS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1974. 17 refs. (Presented at the Air Pollution Control Associaton, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-262.)*

Measurements made with the Minnesota Aerosol Analyzing System (MAAS) in Denver, near Denver, and near Ft. Collins, Colo. are reviewed in the light of what has been learned from several thousand size distributions measured in various other parts of the U. S. The multimodality of aerosols in confirmed and discussed. On a surface distribution plot, the Aitken Nuclei Range mode occurs at a particle diameter of about 0.01 micron, and aged aerosols are in the Accumulation Range between 0.1 and 1 micron, and windblown dusts, sea sprays, and mechanically produced particles such as fly ash generate a Coarse Particle Range mode at particle sizes above 1 micron. The air environment is categorized into four types of background aerosols: clean continental, average western continental, urban district, and oceanic. The physical characteristics of these categories may be described by a limited number of parameters such as VT (total aerosol volume), NT (total number of particles per unit volume in the aerosol, V3- (the volume area of subrange 3), and b scat (light scattering coefficient). The density of submicron particles is inferred by a comparison of MAAS volume distributions with impactor-measured mass distributions. The density range from 1.1 to 1.5 g/cu cm for aerosols during an air pollution episode. The density of background aerosols is about 1.7 g/cu cm. About 30% of the submicron mass consists of benzene-soluble organics during clean days and over 50% during polluted days. (Author abstract modified)

47979 **APTIC NO. 65645**

Tokyo Metropolitan Government (Japan), Ota District

INVESTIGATION DATA FOR POLLUTION CONTROL MEASURES, 1973. *(Kogai boshi taisaku chosa shiryoshu). Text in Japanese. 180p., March 1974.*

Air investigations were conducted in the Ota District of Tokyo for suspended particulate metal content and automotive exhaust gases. Suspended particulates were sampled by high-volume sampler, low-volume sampler, and Andersen sampler, and content of aluminum, cadmium, vanadium, lead, manganese, iron, copper, zinc, chromium, and nickel, and particle size were analyzed by atomic absorption spectrophotometry. The periodical investigations were conducted four times a year at 17 locations and the consecutive investigation was conducted at four locations once a month. The exhaust gas analysis was conducted at three locations including Haneda Airport, and nitrogen dioxide, nitric oxide, carbon monoxide, hydrocarbon, and oxidant were measured. The total amount of dusts was not particularly high, in the area of 100-200 micrograms/cu m by hi-vol, and in the area of 60-120 microgram/cu m by lo-vol. The total amount of dusts has decreased since 1970, but the metal content has not. The ratio of Ni, Cr, and V in the samples at the Haneda Airport was extremely high. One elementary school in a residential area, completely away from any factory, had a relatively high ratio of Al and Cr. The greatest ratio of particles was in the less-than 0.43 micron order. In all three monitoring locations for nitrogen oxides, the level of NO2 exceeded the environmental standard by a factor of 2.5 to 3.5. Pollution by HC was quite serious also, exceeding the U. S. environmental standard of HC 5-10 times. The total HC ranged from 0.5 to 2.6 ppm, CO from 0.7 to 2.5 ppm, NO from 0.01 to 0.07, and NO2 from 0.01 to 0.05 ppm.

47980 **APTIC NO. 69373**

Research Triangle Inst., Research Triangle Park, N. C.

INVESTIGATION OF OZONE AND OZONE PRECURSOR CONCENTRATIONS AT NONURBAN LOCATIONS IN THE EASTERN UNITED STATES (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1343, and 68- 02-1077, Program Element 1HA326, Rept. EPA-450/3-74-034, 249p., May 1974. 23 refs.*

NTIS: PB 236931/AS

The concentration of ozone and ozone precursors in nonurban locations in the eastern United States was investigated by taking continuous ground-level ozone measurements at McHenry, Maryland; Kane, Pennsylvania; Coshocton, Ohio; and Lewisburg, West Virginia between June 26 and September 30, 1973. Nitrogen dioxide and nonmethane hydrocarbon concentrations were also determined at all stations during this period with the exception of McHenry, Maryland. Hourly ozone concentrations exceeded the National Ambient Air Quality Standard for photochemical oxidants 37, 30, 20, and 15% of the hours for which data were available at McHenry, Kane, Coshocton, and Lewisburg, respectively. Quality assurance studies indicated that the average relative bias for the ozone concentration measurements was plus or minus 10%. Nitrogen dioxide concentrations were at or near background levels through the study. Between-station linear correlation coefficients for hourly ozone concentration comparisons varied from 0.468-0.678 for simultaneous data. The occurrence of high ozone concentrations at nonurban locations in the eastern United States was widespread. Chemiluminescent data taken by aircraft confirmed that high ozone concentrations observed at the surface were generated in the lower troposphere.

47981 **APTIC NO. 70193**

California Air Resources Board, Sacramento, Calif., Air Analysis Section

TEN-YEAR SUMMARY OF CALIFORNIA AIR QUALITY DATA 1963-1972. *211p., Jan. 1974. 8 refs.*

Yearly summaries of air quality data (organized by air basin) from California air monitoring stations are presented for the years 1963-1972. The tables show, by station, each day s maximum hourly concentrations (up to 365 measurements/yr) for the gaseous pollutants carbon monoxide, sulfur dioxide, nitrogen dioxide, nitric oxide, nitrogen oxides, hydrocarbons, and oxidants. Particulate measurements by the American Iron and Steel Institute method (soiling index) are also summarized in the above format but the averaging time is 2 hr. Particulate measurements by the high-volume method (collections made over a 24-hr period) contain mostly data from recent years. Included in appendices are: editing criteria for the measurements reported in the tables, an alphabetical listing of the air monitoring stations, a listing of agencies that provided the basic measurements, a discussion of a sample table, definitions of statistical terms, units and conversion factors, a summary of analytical methods used, and a bibliography.

1973

47982 **APTIC NO. 65164**

Ebisawa, Eiji and Takeo Takahashi

SULFUR OXIDES AND SUSPENDED PARTICULATES IN THE HITACHI-KASHIMA AREAS. *(Hitachi narabi ni kashima chiku ni okeru io sankabutsu to fuyu ryushijo busshitsu ni tsuite). Text in Japanese. In: Ibaraki-ken Kogai Gijutsu Senta Kenkyu Hokoku. p. 21-33, July 1973.*

Air pollution measurements taken at four locations in the Hitachi area from April 1969 and five locations in Kashima area from January 1971 are reviewed. At one representative location in Hitachi area, the yearly average sulfur oxides level reached a maximum value of 0.044 ppm in 1971, decreasing thereafter to 0.028 ppm in 1972, in accordance with the general trend in this area. This decrease is attributed to a large-scale pollution control device installed in Nippon Kogyo plant. In Kashima area, the level of SOx remained unchanged from 1970 to 1971, followed by a slight increase in 1972. In Hitachi area, the seasonal trend of higher SOx level is attributed to northwest wind blown from the direction of Nippon Kogyo and in summer to the coastal industrial area. In Kashima area where pollution sources are located in a coastal area, a slight increase occurs in summer due to sea wind. Suspended particulates measured by the light scattering method which also registers fogs were compared with those by the gravimetric method using low volume air sampler. Monthly average values remained practically unchanged except in winter when slight increase due to fogs was observed. In both Hitachi and Kashima areas, SOx levels were lower than the environmental standard; yearly averages were 0.025-0.003 ppm in Hitachi and less than 0.02 ppm in Kashima. The suspended particulate levels were also lower than the environmental standard; yearly averages were 0.02 mg/cu m in Hitachi and 0.01-0.04 mg/cu m in Kashima.

47983 **APTIC NO. 64995**

Ito, Takashi, Torao Yoshinaga, and Yoshihiko Matsuda

THE PRESENT STATE OF AIR POLLUTION IN THE IWAKUNI AREA. *(Iwakuni chijki ni okeru taiki osen no genjo ni tsuite). Text in Japanese. In: Data on Studies of Air Pollution in Iwakuni (and Waki Village). Yamaguchi Prefectural Research Inst. for Health (Japan), p. 137-147, Dec. 1973.*

The lead dioxide method of measuring sulfur trioxide and sulfur dioxide was established in Iwakuni in Sept. 1964, and an automatic measurement recorder was installed in September 1966. The records of 1968-69 measurements in Iwakuni and Waki were compiled and compared with the data of adjacent Otake in Hiroshima Prefecture. The $PbO2$ measurement averages in 1968 were 0.46 $SO2$ mg/day/100 sq cm in Iwakuni, 0.68 mg in Waki, and 0.79 mg in Otake; those in 1969 were 0.45, 0.65, and 0.74 mg respectively. The order of high concentration was slightly different by the automatic meter, and the 1968 averages were 0.036 ppm in Iwakuni, no measurements in Waki, and 0.045 ppm in Otake, and the 1969 averages were 0.032, 0. 027, and 0.036 respectively. The fuel oil consumption increased by 6% in 1969 in Iwakuni. but the total sulfur oxide emission quantity decreased by 3%. In all three areas, the adjacent industrial belt along the coast is obviously heavily affecting the atmosphere. No warning or alert have been required in the Iwakuni-Waki area, but the hourly average concentration of more than 0.1 ppm of $SO2$ occurred 384 hours in 1968 and 242 hours in 1969.

47984 **APTIC NO. 67155**

Jost, D. and J. Mueller

COMPARISON OF THE GASEOUS POLLUTANT AND AEROSOL CONCENTRATIONS IN POLLUTED AIR. *(Vergleich der Konzentrationen von Schadgasen und Aerosolen in verunreinigter Luft). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 66-69. 5 refs. (Oct. 17-18.)*

The possibility of the use of leading pollutants for the estimation of one pollutant from the measured concentration of another in the atmosphere by correlation and regression analysis is demonstrated by examples. The increase in dust concentration due to chemical reactions is accompanied by an overall increase in the pollution level. The contribution of sulfur dioxide to the total atmospheric sulfur in Frankfurt am Main was 18 times that of the sulfate sulfur in winter due to prevalent anthropogenic $SO2$ emission but it decreases in summer against a background of an overall decrease of the atmospheric sulfur level, which is due to a different emission pattern and different chemical reactions. The sulfate gradient shows less pronounced seasonal variation than does the $SO2$ gradient. The sulfate concentration in the atmosphere is 4 to 10 times higher than the ammonium sulfate actually measured. Close correlation between the atmospheric carbon monoxide and lead concentrations was established, especially for high CO levels.

47985 **APTIC NO. 69209**

Matsumoto, Hiromi, Takashi Sumimoto, Shigehiko Matsumoto, and Nobuaki Izumo

INVESTIGATION OF SETTLING PARTICLES IN KAGOSHIMA PREFECTURE (IZUMI AND KAMIYAKU-CHO). *(Kagoshima-ken (Izumi-shi, Kamiyaku-cho) ni okeru koka baijin ryo chosa ni tsuite. Text in Japanese. Kagoshima-ken Kogai Eisei Kenkyusho-ho (Rep. Kagoshima Prefect. Inst. Pollut. Pub. Health), no 9:88-96, Aug. 1973.*

As basic studies for air pollution prevention measures, measurements of settling particles in Izumi city and Kamiyaku-cho in Kagoshima prefecture were made. In Izumi, settling particles were measured by the deposit gauge method near a kraft pulp factory and an alcohol manufacturing plant. Both plants are small, and the kraft pulping plant produces about 40,000 tons of bleached pulp a year. Settling particles were captured in a jar of 10-20 l capacity with a funnel opening of 30 cm diameter for a month, and pH, the total liquid, nonsoluble material, ashes, solubles, and settling dusts were measured. The total monthly average of dusts for 1972 was 6.37 tons/sq km/mo, which was 1.5 tons more than the 1971 measurement, but this amount was equivalent to the average dust fall in relatively unpolluted areas. The amount of dust increased between January and March, and the level of sulfuric acid ion was high because of the closeness of the stack gas to the alcohol plant. Samples at Kamiyaku-cho were taken by dust jars made of polyethylene. This town is located on Yaku Island, which has the highest rain precipitation level in Japan, and the dust jar method was not satisfactory. The methods for sampling are being studied. The main emission source in this township is an electrochemical factory manufacturing silicon iron, metal silica, and silica carbide, using silicon, cokes, coal, and metals. The averagely monthly settling particles for 1972 was 9.6 tons/sq km/mo, which was about the same as the 1971 measurement. The quantity increased in July and August due to typhoons.

47986 **APTIC NO. 69529**

Muehleisen, R.

THE CONCENTRATION OF ATMOSPHERIC SMALL IONS OVER THE ATLANTIC OCEAN AS AN INDICATION FOR A GLOBAL AIR POLLUTION. *(Die Kleinionenkonzentration ueber dem Atlantik als Indikator fuer die globale Luftverschmutzung). Text in German. Bonner Meteorol. Abhandl., no. 17:569-573, 1973. 6 refs.*

Implications of the atmospheric small ion concentration on the global air pollution are discussed on the basis of small ion and aerosol concentration measurements over the Atlantic Ocean. The decrease of ion concentration and the increase of the aerosol concentration as recombination play no role at high aerosol concentrations. As the concentration of atmospheric small ions is balanced by ionization and ion destruction, and as the ionization in oceanic air is practically constant due to the constancy of cosmic radiation, the concentration of ions and consequently the air conductivity depend on processes of superposition on aerosol particles. While the small ion concentration over the Atlantic Ocean was approximately 600 pairs/cu cm in the 1920 s, measurements conducted in 1965 and 1969 indicated a drop to about 250 pairs/cu cm. This can only be explained from the increase of air pollution over the Atlantic Ocean by a factor of nearly three. The aerosol concentration is estimated to have increased from about 150 per cu m in 1910 to 500 per cu cm in 1970.

47987 **APTIC NO. 69233**

Osumi, Yasuaki

COOPERATIVE EXPERIMENT ON ATOMIC ABSORPTION SPECTROPHOTOMETRY ANALYSIS OF ENVIRONMENTAL MATERIALS--DUSTS AND SEABED OIL. *(Kankyo shiryo no genshi kyuko bunseki ni yoru kyodo jikken-- funjin oyobi kaitei dojo). Text in Japanese. (Preprint, Japan Society for spectroscopy, p. 24-28, 1973. (Presented at the Japan Society for Spectroscopy, Spring Meeting, May 24-25, 1973.)*

From 1971, cooperative experiments have been conducted to determine the presence of various metallic elements in environmental materials (atmospheric dusts and seabed soil). In order to determine the metal content in dust in Osaka dust samples were collected with a high-volume sampler from 13 locations. The individual dust samples were well-mixed into a homogeneous sample, which was then divided among 12 concerns for analysis. About 8 g. were sent to each participating group. Uniform methods of sample treatment were outlined, and the results were tabulated. The analysis was performed on two different samples for iron, lead, manganese, cadmium, nickel, chromium, conadium, copper, and zinc. The concentrations ranged from a high of 742 ppm for Fe to a low of 0.32 ppm for Cd. Variations in the results were somewhat less than desirable. Homogeneous 100 g. samples from Osaka Bay were distributed to 23 participating groups for analysis for Cd, Cu, Cr, Mn, Pb, and Zn in a uniform fashion. Analysis was repeated three times, using different analytical procedures prior to the photometric analysis. Accurate analysis for Cr and Pb proved troublesome, and the photometric analysis procedures were revised to improve the results. The Mn was present in the highest amounts (452 ppm), followed by Zn (340 ppm).

47988 **APTIC NO. 67081**

Perry, John

FASTEN YOUR SEAT BELTS. NO SMOKING. (HAZARDS OF TOBACCO SMOKE). *B. C. (Brit. Columbia), Med. J., 15(10):304-305. Nov. 1973.*

Determinations were made of the concentration of benzo(a)pyrene and carbon monoxide in the air of indoor areas in Vancouver where people customarily smoke. The levels of these compounds in the outside urban atmosphere were also measured at several locations in Vancouver. In all cases, the CO concentration was less than 10 ppm. In the indoor areas heavily polluted with tobacco smoke, concentrations as high as 760 ng of benzo(a)preyene/cu m of air were found. These values are many times higher than any of the benzo(a)pyrene levels found in samples of the outside air, and are also much higher than a published figure of 6.6 ng/cu m expressing the median Jan.-March urban benzo(a)pyrene concentration in the U. S. (Author abstract)

47989 **APTIC NO. 69480**

Siegel, S. M.

MERCURY: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY (SEMI-ANNUAL REPORT). *Hawaii Univ., Botany Dept., National Aeronautics and Space Administration Grant NGL 12-001-042, NASA- CR-13838, Hawaii Univ. Botanical Science Paper 33, 59p., June 1973. 58 refs.*

NTIS: N74-22960

Mercury in the environment is reviewed, including its abundance, toxicity, and sources. Minimata disease, organic mercury poisoning, biological alkylation, effects of mercury on enzymes, the mercury in fish scare, and mercury in the environment are reviewed. Results of a study of mercury contamination in Hawaii are also presented. Mercury was measured in air, plants, fish, beef kidney, rain, water, soil, sediment, and rock samples. The mercury concentrations in micrograms/cu m were 0.04 + or - 0.02 at the Manoa Campus, University of Hawaii, 0.14 + or - 0.10 at Ala Moana Blvd. at Piikoi Street, 40.5 and 0.73 at Halemaumau Caldera, and 23.3 + or - 5.4, 21.4 + or - 8.5, 2.2 + or - 1.0, and 33.5 + or - 7.4 on various dates as Sulfur Banks. Mercury contents in microgram/l were 20-40 in the fumarole condensates at the Sulfur Banks, 0.17 + or - 0.05 in rainwater at seven sites on Hawaii, and 0.15 in rainwater at Lihue, Kauai. The evidence showed mercury principally enters the Hawaiian environment as a natural product of vulcanism.

47990 **APTIC NO. 67112**

Sung, Fung-Chiang and Chin-Yuan Chuang

AIR POLLUTION IN TAIPEI CITY. *Tai-Wan I Hsueh Hui Tsa Chih Formosan Med. Assoc., 72(5):267-278, 1973. 31 refs.*

Air quality measurements were made in Taipei from Nov. 1970 to Nov. 1971. The average annual concentration for dust was 17.39 tons/sq km/mo and the concentration of suspended particulate matter averaged annually 277 micrograms/cu m. The values for the industrial area were double these figures. The concentrations of haze and sulfur dioxide were close to the limits of the standard for health. They reached their highest peaks in the morning, decreased in the afternoon, and increased again in the evening. The area with the highest carbon monoxide pollution was in front of the Police Bureau. There were only 5 hr a day in which the concentration was below 10 ppm at ground level, with a maximum value of over 20 ppm from 6-9 pm. The highest seasonal average of SO2 was 0.062 ppm found in the spring, and the lowest value was 0.033 ppm found in the summer. The highest seasonal values in the downtown area, 1.74 COHS (concentration of haze units)/1000 ft for haze and 22.1 tons/sq km/mo for dustfall, were in the winter. (Author abstract modified)

47991 **APTIC NO. 69178**

Yamaguchi Prefectural Research Inst. for Health

CONCENTRATION OF SULFUR DIOXIDE AT TWO LOCATIONS IN IWAKUNI AND CONCENTRATION OF SUSPENDED PARTICULATES. *(Iwakuni shigaichi no taiki osen: koka baijin oyobi aryusan gasu, fuyu funjin no sokutei seiseki). Text in Japanese. In: Data on Studies of Air Pollution in Iwakuni (and Waki Village), Yamaguchi Prefectural Research Inst. for Health (Japan), p. 41-63, Dec. 1973.*

Of the ten sulfur dioxide monitoring locations in Iwakuni utilizing the lead dioxide method, the most polluted between Sept. 1964 and Aug. 1965 was the primary school in the northern sub-industrial area, followed by the Mitsui Petroleum company housing project in the same area, and the City Hall. The least polluted location was west Iwakuni. The southern residential and commercial areas were relatively unpolluted. The highest measurement of the year was 1.32 mg/day/100 sq cm in October at the above-mentioned school, and the lowest was 0.16 mg at a school in a southern residential area in July. The total average from the year at monitoring locations was 0.53 mg. The degree of SOx pollution of Iwakuni is about medium in Japan, but localized high degrees of pollution must be watched. The highest measurement for settling particles was 11.99 tons in the same northern school, and the minimum was 2 tons in remote areas. The years average at seven monitoring stations was 6.41 tons/mo/sq km. A large part of the components was nonsoluble, which showed a considerable geographical difference in consistency. In areas with greater quantities of dusts, the amount of nonsolubles was two to three times more than that of solubles, but in the less polluted south, the ratio of solubles was larger. The amount of settling particles was greater between April and June, and the fluctuation pattern paralleled the amount of rain precipitation, with the maximum of rain and dusts in June.

47992 **APTIC NO. 69828**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

NATIONAL AIR POLLUTION SURVEILLANCE MONTHLY SUMMARY FOR JULY 1972. *EPS Surveillance Rept. 5-AP-73-6, 123p., May 1973.*

The National Air Pollution Surveillance monthly summary for July 1972 is presented. Data were obtained from 237 sampling instruments in 37 cities across 10 provinces in Canada. Measurements were made for soiling index, suspended particulates, lead, dust fall, sulfation rate, and sulfur dioxide. Each sampling station is identified by a code which defines its location and the class of stations as commercial, residential, or industrial. The methodology used is described, and the appropriate sampling locations are listed.

47993 **APTIC NO. 69875**

Narashino Municipal Government, Chiba Prefecture (Japan)

WHITE PAPER ON PUBLIC NUISANCE IN NARASHINO-CITY, 1973. *(Narashino-shi kogai hakusho). Text in Japanese. 144p., Dec. 1973.*

Narashino is one of the towns on the outskirts of Tokyo and is the most congested city in Chiba Prefecture with its 104,731 population and its 6584.4/1 sq km density. There are seven large industries, and some medium and small size industries. Sulfur oxides were monitored by lead dioxide cylinders at five locations and by electroconductivity at two locations. The SOx measurements have been decreasing gradually since 1972. For 1972, the maximum concentration was 0.16 ppm, at one location in Feb. and one in August, and the annual averages were less than 0.02 ppm without much variation. If the measurement by lead dioxide is less than 1.0 mg/day/100 sq cm, it is believed to be well within the environmental standard, and the area generally passes the standard. Suspended particulates are measured at two locations in the city, and the annual average is 0.07 mg/cu m. The highest hourly measurement in 1972 was 0.96 mg/cu m in April. The annual average for 1972 at the municipal pollution control office for 1972 was 0.03 mg/cu m, and the highest figure was 0.30 mg/cu m in Sept. The environmental standard is 0.2 mg/cu m maximum. High oxidant measurements of over 0.1 ppm were found between April and November; the 1972 average was 0.02 to 0.04 ppm. Plant damage, especially to scallions, occurred every June and July. The causes are being studied.

1972

47994 **APTIC NO. 69501**

Just, Jan, Maria Borkowska, and Stefan Maziarka

POLLUTION OF AIR BY TOBACCO SMOKE IN WARSAW CAFES. *Annu. State Hyg. Inst., 23(2):129-135, 1972. Translated from Polish. Ralph McElroy Co., 11p.*

Air pollution by tobacco smoke was studied in some coffee houses in Warsaw, Poland. The amounts of dust, tar, aromatic polycyclic hydrocarbons, phenols, and aldehydes inside the cafes and in outdoor air were measured and compared. On the average, the dust content in cafes was 1.15 mg/cu m and outside was 0.57 mg/cu m, even in areas polluted by automobile traffic. Tar concentrations extracted from dust by benzene averaged 0.62 mg/cu m indoors and 0.075 mg/cu m outdoors. Relatively small differences were confirmed in the area of aromatic polycyclic hydrocarbons. Tobacco smoking in crowded rooms with poor ventilation was thus a source of air pollution constituting a threat to health to smokers and nonsmokers. Tobacco pollution is particularly threatening to persons residing in area or living in quarters where other types or additional air pollutants are simultaneously present which may originate from industrial plants, vehicles, or domestic heating. For the protection of the health of persons who smoke and who do not smoke, tobacco smoking should be prohibited in enclosed rooms designated for public gathering.

47995 **APTIC NO. 69343**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

NATIONAL AIR POLLUTION SURVEILLANCE ANNUAL SUMMARY FOR 1970. *EPS Surveillance Rept. 5-AP-72-1, 99p., Dec. 1972.*

The National Air Pollution Surveillance annual report for 1970 is presented. Data were obtained from 237 sampling instruments in 37 cities across 10 provinces in Canada. Measurements were made for soiling index, suspended particulates, lead, dust fall, sulfation rate, and sulfur dioxide. Each sampling station is identified by a code which defines its location and the class of station as commercial, residential, or industrial. The methodology used is described, and the appropriate sampling locations are listed.

47996 **APTIC NO. 69542**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

NATIONAL AIR POLLUTION SURVEILLANCE ANNUAL SUMMARY FOR 1971. *EPS Surveillance Rept. 5-AP-72-3, 119p., Dec. 1972.*

The National Air Pollution Surveillance annual report for 1971 is presented. Data were obtained from 237 sampling instruments in 37 cities across 10 provinces in Canada. Measurements were made for soiling index, suspended particulates, lead, dust fall, .sulfation rate, and sulfur dioxide. Each sampling station is identified by a code which defines its location and the class of station as commercial, residential, or industrial. The methodology used is described, and the appropriate sampling locations are listed.

1971

47997 **APTIC NO. 70038**

Air Pollution Measuring Network Study Group

REPORT ON RESEARCH CONCERNING MEASUREMENT AND TRANSMISSION OF CARBON MONOXIDE CONCENTRATION IN AMBIENT AIR (ENVIRONMENTAL POLLUTION SURVEYS AND RESEARCH FOR FISCAL YEAR 1970 COMMISSIONED BY MINISTRY OF HEALTH AND WELFARE). *(Kankyo taikichu ni okeru issanka tanso nodo no sokutei oyobi denso ni kan-suru kenkyu hokokusho (Showa 45-nendo kogai chosa kenkyu koseisho itaku ni yoru). March 1971. Translated from Japanese, 257p.*

Research concerning the measurement methods and data transmission methods for the carbon monoxide concentration in the atmosphere is discussed. The current state of CO pollution and methods of selecting places for continuous or cumulative measurements are reviewed. The non-dispersive infrared method, continuous and automatic sampling equipment standards for air pollution monitoring facilities, problems in multi-source CO measurement, and methods of transmitting CO concentration data are discussed. Data are given on daily and seasonal CO concentrations in Tokyo and Osaka. The effects of traffic along streets and highways and near intersections on CO concentrations are discussed.

1970

47998 **APTIC NO. 65466**

Belyashova, M. A., O. P. Petrenchuk, and Y. S. Selezneva

STUDY OOF THE PHYSICOCHEMICAL AND ELECTRICAL PROPERTIES OF ATMOSPHERIC AEROSOLS. *Tr. Vses. Konf Fiz. Oblakov Aktiv. Vozdeist. vol. 8:84-92, 1970. 14 refs. Translated from Russian by Victor Mesenzeff, Air Force Systems Command, Wright-Patterson AFB, Ohio, Translation Div., FTD-HT-23-67-74, 18p., Oct. 1, 1973.*

NTIS,DDC: AD 768047

Research on the study of the physiochemical and electrical properties of atmospheric aerosols is summarized. A large number of flights were carried out over various regions of the European territory of the USSR to measure the aerosol concentration and take samples for subsequent chemical analysis. Using chemical and spectral methods, the content of the chlorine, sulfate, nitrate, carbonate, ammonium, sodium, potassium, magnesium, and calcium ions and also the value of electric conductivity and the pH were determined in the samples of atmospheric waters and aerosols. Data concerning the chemical composition and concentration of aerosol particles in the 250- 1000-meter layer over these regions were tabulated and show the aerosol characteristics differ considerably in the regions. The southwestern regions are the most contaminated. The SO4 ions comprise about 40% of the total concentration; Ca and NH4 ions values are also high. The content of aerosol particles insoluble in water in this and other southern regions is relatively high and according to some estimates, is 70-80% of the total mass of particles.

ATMOSPHERIC INTERACTION

1975

47999 **APTIC NO. 70077**

Coffey, Peter E. and William N. Stasiuk

EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS. *Environ. Sci. Technol., 9(1):59-62, Jan. 1975. 5 refs.*

Ozone concentrations were measured at various sites in New York State to determine evidence of atmospheric transport of ozone into urban areas. In the late spring and throughout the summer, O3 concentrations in excess of 0.08 ppm were commonly found in rural areas of New York State. Widely separated rural sites had similar O3 concentrations with very slight diurnal fluctuations. During episodes of high rural O3 concentrations, urban areas also experienced high O3 peak concentrations, typically in the early afternoon. A transport and mixing hypothesis was developed which interprets these urban O3 peak concentrations as primarily the result of the high background level of O3 and of not local photochemical generation. (Author abstract modified)

48000 **APTIC NO. 70094**

Ragland, Kenneth W. and J. Jeffrey Peirce

BOUNDARY LAYER MODEL FOR AIR POLLUTANT CONCENTRATIONS DUE TO HIGHWAY TRAFFIC. *J. Air Pollution Control Assoc., 25(1):48-51, Jan. 1975. 8 refs.*

A numerical solution of the three-dimensional, steady-state diffusion equation for a finite width line source is presented. The wind speed and eddy diffusivity are a function of height above the roadway and are obtained from the surface roughness, the net heat flux, and the upper wind speed. Normalized ground level and elevated concentrations near a highway are obtained for winds perpendicular to the roadway, parallel, and at 45 deg to the roadway. This method for calculating pollutant.concentrations near a highway allows for more physical realism than the simple Gaussian plume model and can be used for winds at any direction to the roadway. (Author abstract modified)

48001 **APTIC NO. 69419**

Van Valin, Charles C., Rudolf F. Pueschel, Farn P. Parungo, and Richard A. Proulx

CLOUD AND ICE NUCLEI FROM HUMAN ACTIVITIES. *Preprint, National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., 23p., 1975 (?). 16 refs.*

Measurements of aerosol characteristics (light scattering, Aitken nuclei, cloud condensation nuclei, ice nuclei, and chemical composition) were made in the Denver, Colorado area during November 1973. Light scattering and atmospheric concentration of cloud condensation nuclei were directly and positively correlated with pollution intensity, and the formation of cloud condensation nuclei and light scattering particles was accelerated by sunlight. Natural production of ice nuclei during windy periods greatly exceeded man-made production during pollution episodes. Lead, chlorine, and bromine were found mostly in particles with diameters less than 0.5 micron. Such particles are capable of coagulating with larger, predominantly siliceous, particles. The fraction of aerosol particles containing lead increased during a pollution episode. Cities appear to be copious producers of cloud condensation nuclei and have the capacity to affect the precipitation budget in downwind areas.

1974

48002 **APTIC NO. 69434**

Abel, Michael D. and James E. Newman

AIR QUALITY CHANGES ASSOCIATED WITH THE ATMOSPHERIC TRANSPORT OF TOTAL SUSPENDED PARTICULATE IN AND AROUND CHICAGO. *Preprint, Purdue Univ., West Lafayette, Ind., Agricultural Experiment Station, 23p., 1974. 3 refs.*

An analysis is made of the wind directional effects on the atmospheric transport of total suspended particulate in and around the city of Chicago. Daily and annual estimated values in micrograms/cu m are reported for total suspended particulates advected into Chicago from surrounding industrial, urban, and rural areas. Using 8 years of data in the analysis, estimates are given for the mean annual values of total suspended particulate advection from northwest Indiana into Chicago, Ill. Some estimates are given for corresponding mean daily values of total suspended particulate advection into Chicago as well. The estimated maximum value of total suspended particulate increase due to advection from Indiana into Chicago was computed as 4% for the 8-year average. (Author abstract modified)

48003 **APTIC NO. 69737**

Akagi, Yasuharu, Tamiya Kishimoto, Hiroshi Kumura, and Teruo Takahashi

AN OBSERVATION FOR THE RELATIONSHIP BETWEEN THE WEATHER AND AIR POLLUTION OF THE MIZUSHIMA AREA. *(Mizushima chiku no kisho to taiki osen no kankei ni tsuite no ichi kosatsu). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 123-126, 1974. (Presented at the Symposium on Systems Engineering for Environmental Control, Toyama, Japan, July 18, 1974.)*

Concentration distribution and conditions of high concentration appearance at Mizushima area were investigated. The relationship between the meteorological conditions and the sulfur dioxide concentration was studied using data obtained from 19 monitoring stations in 1973. About 90 plants were operating on an area of 42,000,000 sq m, and there were about 500 SO2 emitting sources. South winds from the sea at 2 to 4 m/sec at a height of 500 m blow from spring to summer. The wind carries pollutants into the inland and causes high pollution concentrations. About 67% of the high concentration predictions were made from April to August. Concentrations at times of a south or southwest wind were almost four times higher than those at times of north and east wind. At a monitoring station which is located at the northeastern side of the industrial area, 34 days in July and August had an SOx concentration higher than 0.1 ppm. Constants of Sutton s diffusion parameters were calculated and compared to the Pasquill s.

48004 **APTIC NO. 69413**

Alkezweeny, A. J., D. W. Glover, R. N. Lee, J. W. Sloot, and M. A. Wolf

MEASUREMENTS OF DRIFT FROM A MECHANICAL DRAFT COOLING TOWER. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 235-240, April 1974.*

NTIS: BNWL-1850 PT3

The air concentrations and surface deposition rates of chromium in solution in drift droplets originating from a mechanical draft cooling tower were measured at the Oak Ridge Gaseous Diffusion Plant. Deposition fluxes were 1 mg/(sq m hr) within 50 m of the tower and approximately two orders of magnitude lower at 1 km. Air concentrations over that same distance decreased by less than an order of magnitude with values of approximately 40 ng/cu m observed to distances of about 100 m. Air concentration and deposition flux appear unrelated, the former due to downwash of fine droplets at the tower. The Cr circulation rate during these measurements, based on a chromate concentration of 15 ppm in the circulating water, was 76 kg/hr. (Author abstract modified)

48005 **APTIC NO. 69854**

Asakuno, Kunihiko Kazuyuki Aoki, Masanao Funashima, and Toshio Ohira

THE RELATIONSHIP BETWEEN PHYSICAL PROPERTIES OF AEROSOLS AND OXIDANT CONCENTRATIONS. *(Earozoru no butsuri tokusei to okishidanto). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):168, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 21.)*

The coagulating of nuclei (particles smaller than 0.1 micron) in aerosols in ozone scavenging is discussed. A high ozone level in the atmosphere is often observed in conjunction with a low nitric oxide level without the possibility at wind transport of ozone from other areas. The relationship between particle size and ozone level was studied and showed that the concentration of ozone was in inverse proportion to the number of coagulating nuclei per volume atmosphere, while the number of airborne particulates (particles larger than 0.3 micron) had no relation to the ozone level.

48006 **APTIC NO. 69372**

Bates, Earl M.

SMOKE MANAGEMENT IN THE WILLAMETTE VALLEY. *National Oceanic and Atmospheric Administration, Salt Lake City, Utah, National Weather Service, NOAA Technical Memorandum NWSTM WR-92, 8p., May 1974. 8 refs.*

Smoke management studies are reviewed for opening burning in the Willamette Valley. The studies indicate that the number of acres of field residue which can be burned in the valley on a given day without overburdening the air can be predicted; and climatology of the valley indicates that by making use of predictive equations, management of smoke from field burning is possible. A reasonable estimate of what can be well-managed in one season is 100,000 areas of burning. Wind and thermal stability of the atmosphere appear to be the two important meteorological variables necessary for making estimates of the transport and dispersion of smoke. Research shows that there is a direct relationship between atmospheric instability near 3000 ft and visibility in the southern Willamette Valley. A temperature decrease of 4 C or more is required in the region between 3000 and 6000 ft over the valley to get sufficient vertical motion to disperse the smoke from the lower atmosphere of the valley when more than 6000 or 7000 acres are burned in one day. The condition of instability (temperature decrease of 4 C or more between 3000 and 6000 ft aloft) appears to occur less than half of the time in the field burning season.

48007 **APTIC NO. 69938**

Beri, Pradeep

NUMERICAL PREDICTION OF GROUND-LEVEL CONCENTRATIONS OF AIR POLLUTANTS RESULTING FROM EMERGENCY RELEASE OF A CHEMICALLY REACTING SYSTEM. *Kansas Univ., Lawrence, Kans., Dept. of Chemical Engineering. Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974. 214p. 30 refs.*

A method is developed for including the effect of chemical reaction during the numerical prediction of ground-level concentrations of gaseous air pollutants resulting from an emergency release of the contents of a chemical reactor. Two numerical models are investigated: a comprehensive model which involves the solution of the complete set of equations of change for continuity, motion, and energy for a multicomponent chemically reacting system with a source term and a simplified model which involves the numerical solution of a simplified equation of continuity in moving and cylindrical coordinates. An algorithm is developed to solve the equations of change in the comprehensive model, and a computer program based on this algorithm is presented. The computation cost for the comprehensive model is high, however. The simplified model is based on the assumption that the gaseous pollutant mixture is injected into the atmosphere at the ambient temperature and velocity; and, unlike current methods for predicting ground-level concentrations of material released instantaneously, the model accounts for terrain roughness and chemical reaction. The simplified model gives good agreement with experimental diffusion data, and the effect of terrain roughness and chemical reaction on the ground-level concentration is significant. The scope of the simplified model can be increased by including a gravitational setting which is significant for heavy gases and particles larger than 5 microns. (Author abstract modified)

48008 **APTIC NO. 65840**

Bogen, J.

TRACE ELEMENTS IN PRECIPITATION AND CLOUD WATER IN THE AREA OF HEIDELBERG, MEASURED BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS. *Atmos. Environ., 8(8):835-844, Aug 1974. 7 refs.*

The concentration of 17 trace elements in rain water residues, collected in Heidelberg (April-June 1971) were determined by thermal neutron irradiation in a flux of 3 times 10 to the 11th power n/sq cm/sec and gamma-ray spectrometry using germanium (lithium) detectors. Cloud water was collected aboard an airplane at different heights from stratiform clouds and treated like rain for comparison of the trace element concentrations in rain and cloud water. Three groups of elements were found, the main sources of which were presumed to be the ocean (chlorine, bromine), the earth s surface(lanthanum, iron, scandium, manganese, chromium, samarium), and anthropogenous production (silver, cobalt, antimony). There are constant values inside the cloud between 3500 and 2500 m, decreasing concentrations between 2500 and 2000 m, and constant or increasing values for all elements not originating in the ocean between the lowest cloud level and the earth s surface. The concentration of elements which are specific for an aerosol production on the surface of the ocean increased with height, due to the special meteorological situation. (Author abstract modified)

48009 **APTIC NO. 69919**

Cahill, Thomas A. and Patrick J. Feeney

CONTRIBUTION OF FREEWAY TRAFFIC TO AIRBORNE PARTICULATE MATTER (FINAL REPORT). *California Univ., Davis, Crocker Nuclear Lab., California Air Resources Board Contract ARB-502, Proj. 4B-184-7, Rept. ARB-R-502-74-06, Calif. Univ. Rept. UCD-CNL-169, 163p., April 1974. 18 refs.*

NTIS: PB 231617

The total particulate matter burden contributed by motor vehicle traffic was determined by analysis of size-segregated aerosol samples collected upwind and downwind of cut, fill and at-grade freeway sections. Elemental analyses of the samples were performed to determine the selective contribution of exhaust emissions, roadway abrasion, tire wear, and degradation of moving parts. The results were combined with weather data to determine dispersal patterns and the contributions from other sources. In areas adjacent to the downwind side of freeways, the particulate burden was greatest for fill-sections, intermediate for at-grade sections, and least for cut-sections. This information will be useful for urban planning and for designing roadways. The combustion products of gasoline, including lead, bromine, chlorine, and sulfur, provided about 2/3 of all elements heavier than sodium observed in the particulate matter. About 60% of the elements heavier than sodium that were seen in particulates consisted of particles less than 5 micron in size. Combustion products dominated this class, with most mass occurring below 0.5 micron. Dispersion of particulates was dominated by wind conditions, with high values of particulate mass per vehicle mile occurring in calm periods in near-freeway locations. (Author abstract modified)

48010 **APTIC NO. 68429**

Caledonia, G. E. and K. L. Wray

AEROSOL PROPAGATION EFFECTS (MID-CONTRACT REPORT). *Physical Sciences, Inc., Wakefield, Mass., Department of Defence Advanced Research Projects Agency Contract NOOO14-74-COO254, Program Clemet 62301E, ARPA Order 2439, PSI-TR-6, 27p., June 1, 1974. 5 refs.*

NTIS, DDC: AD-782 627

A model was developed for the time-dependent properties of the gas surrounding a water droplet under irradiation by a high intensity laser beam. The basic phenomena included in the model are absorption; heating and vaporization in the droplet; and convection, thermal conduction, and diffusion in the gas. The model assumes volume absorption by the droplet, a constant pressure gas, and that the initial vapor velocity is much less than the local sound speed. The conditions under which these assumptions are appropriate were identified, and preliminary calculations are presented. (Author abstract modified)

48011 **APTIC NO. 70230**

Chiba, Tametoshi

THE SEA AND LAND BREEZES IN OTAKE. *(Otake-shi no okeru karirikufu). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:77-79, Feb. 1974.*

Data collected from April, 1972 to March, 1973 at five stations in the otake and one in a neighboring area were used to carry out stream line analysis. Generally, the sea winds were southeast on south-southeast and the land winds were west-northwest or northwest. The average maximum wind velocity was higher in the west side sea bank area. The highest daily wind velocity was 6.7 m/sec in the summer at the pollution center, which is located at the west side of thee city. The highest daily wind velocity ranged from 4.0 to 6.5 m/sec in the spring, 4.3 to 6.7 m/sec in the summer, 2.9 to 5.8 m/sec in the fall, and 4.3 to 6.3 m/sec in the winter. One of the characteristics was occasional strong north-notheast wind east-northeast in all four seasons at all locations. Stream line analysis was carried out using 24 examples selected from 55 examples from the entire year. The results revealed that the 24 examples showed similar stream lines and changes.

48012 **APTIC NO. 69570**

Clark, G. H. and P. W. Nickola

FITTING AN ANALYTICAL CURVE TO SOME EXPERIMENTAL DIFFUSION DATA. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 60-63, April 1974.*

NTIS: BNWL-1850 PT3

A mathematical technique was developed for fitting a Gaussian curve to crosswind concentration distributions observed in atmospheric plumes. The effect of truncating a Gaussian distribution on the derived estimates of standard deviation and mean value statistics was investigated by considering a platykurtic (flat) distribution and a leptokurtic (pointed) distribution of hypothetical diffusion data. The curve fitting routine in the platykurtic test case, even with the full contingent of 22 data points, slightly overestimated the tracer exposures both near the peak and in the tails of the distribution. Only when greater than eight points were truncated did the curves deviate significantly from the curve fitted through all of the data points. There was good agreement in the leptokurtic case to the point where only one-half of the Gaussian curve was defined. Thereafter, a significant departure occurred between the computed standard deviation and the mean value statistics.

48013 **APTIC NO. 65220**

Clarke, John F. and James L. McElroy

EFFECTS OF AMBIENT METEOROLOGY AND URBAN MORPHOLOGICAL FEATURES ON THE VERTICAL TEMPERATURE STRUCTURE OVER CITIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 11 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-73.)*

The vertical temperature structure over cities during nocturnal hours is discussed relative to that over adjacent rural environs using experimental data collected over two metropolitan areas of different sizes, Columbus, Ohio and St. Louis, Missouri. Specifically, ten pairs of comparative urban-rural profiles of temperature are presented for each of these cities to delineate influences on the urban temperature structure of ambient meteorological conditions in the upwind rural area and of urban morphological factors, such as city size, local surface fabric, and waste heat emissions. A pronounced modification of the low- level temperature structure over a city was found. A relatively unstable layer exists adjacent to the surface, the urban boundary layer. Above this layer the temperature structure is similar to that in the surface layer of the rural environs upwind of the city. The structure of the boundary layer was generally more complex and its mean thickness greater over St. Louis than over Columbus. The former may reflect the passage of air over significant and radically differing land use areas prior to its arrival at urban sounding sites in St. Louis in comparison to Columbus. The latter is probably due in part to the overall persistence of more stable ambient meteorological conditions during the Columbus experiments. A compilation of the data shows the existence of a significant relationship between the thickness of the urban boundary layer and the inverse of the root of the potential temperature gradient in the surface layer of the upwind rural area. Also indicated is a minimum boundary thickness under stagnation conditions of about 50 m for Columbus and somewhat less than 75 m for St. Louis, a larger city. Boundary layer thicknesses in the region near city center can be estimated from the dry adiabatic extension of the maximum urban surface temperature to the upwind rural sounding, the mixing layer concept.

48014 **APTIC NO. 69680**

Corrin, M. L., J. R. Connell, and A. J. Gero

AN ASSESSMENT OF WARM FOG - NUCLEATION, CONTROL, AND RECOMMENDED RESEARCH. *Colorado State Univ., Fort Collins, Dept. of Civil Engineering and Atmospheric Sciences, National Aeronautics and Space Administration Contract NAS8-29583, Rept. NASA CR-2477, M134, 5941, 144p., Nov. 1974. 229 refs.*

NTIS: NASA CR-2477

A state-of-the-art survey of warm fog research is presented. Topics covered include: nucleation, growth, coalescence, fog structure and visibility, effects of surface films, drpp size spectrum, optical properties, sampling and measurement instrumentation, liquid water content, and condensation nuclei. Soluble cloud condensation nuclei are discussed along with nucleation on an insoluble, water-wet substrate. Some typical critical embryo radii are given for water at 10 C. The effect of possible pollutant concentration on the nucleating capability of hygroscopic nuclei can be considered as the sum of several interactions, one of which is the inhibition of the nucleation process. It is generally difficult to evaluate the possible effects of pollutants on the nucleation characteristics of soluble nucleants due to the fact that such pollutants affect growth rates as well as nucleation. Instrumentation for the determination of cloud nucleus concentrations is adequate; and, with the possible exception of droplets whose diameters are less than 1 micron, the measurement capability for particle size distributions in fogs also appears adequate.

48015 **APTIC NO. 69814**

Coulson, Kinsell L., Robert L. Walraven, and Leon B. Soohoo

POLARIZATION OF SKYLIGHT AT AN ALTITUDE OF 3461 METERS ON MAUNA LOA, HAWAII (FINAL REPORT). *California Univ., Davis, Dept. of Agricultural Engineering, National Oceanic and Atmospheric Administration Grant N-22-161-72(N), National Aeronautics and Space Administration Grant NGL 05-003-404, Contributions in Atmospheric Science 9, 55p., March 1974. 11 refs.*

In order to take advantage of the sensitivity of skylight polarization to dust, haze, and other particulate matter for characterizing atmospheric turbidity, a series of measurements of skylight polarization was made at the Mauna Loa Observatory in Hawaii during February and March of 1973. The polarizing radiometer used for the measurements provided data in eight narrow bands in the ultraviolet, visible, and near infrared spectral regions. Results showed that the skylight polarization field at Mauna Loa is much more variable than was anticipated. While certain aerosol effects showed up in the data, they were combined with equally large variations which appeared to be unrelated to atmospheric turbidity. A preliminary interpretation indicated that these nonaerosol effects were probably due to variable reflection properties of clouds and sea surface surrounding the island. If this interpretation is correct, then future measurements for characterizing atmospheric turbidity at Mauna Loa should be made during selected periods of cloudless conditions in the area. In this case the dark lava of the mountain and low albedo of the surrounding sea surface should minimize reflection effects and permit valid and consistent conclusions on atmospheric turbidity at Mauna Loa on a long-term basis. (Author abstract)

48016 **APTIC NO. 69581**

Dana, M. Terry and J. M. Hales

COMPARISON OF THE WASHOUT COEFFICIENT FOR A POLYDISPERSE AEROSOL TO THAT FOR AN AEROSOL OF FIXED PARTICLE SIZE. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT (45-1):1830, p. 117-120, April 1974.*

NTIS: BNWL-1850 PT3

A mathematical analysis of the washout coefficient for a polydisperse aerosol in comparison to that for an aerosol of fixed particle size is presented to show that considerable error can result from characterizing the distribution of a polydisperse aerosol by a single representative particle size. The method of sampling and the differential form of the washout coefficient influence the results of washout experiments when the tracer aerosol is polydisperse. These results apply to the washout of any polydisperse aerosol, natural or artificial, and demonstrate that some knowledge of the differential form is required to properly evaluate the integral washout coefficient. A geometric mean particle radius expression is derived for selecting a representative size for such polydisperse aerosols.

48017 **APTIC NO. 69585**

Dana, M. Terry, Jeremy M. Hales, C. E. Hane, and John M. Thorp

PRECIPITATION SCAVENGING OF INORGANIC POLLUTANTS FROM METROPOLITAN SOURCES: ST. LOUIS, JULY, 1973. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 141-143, April 1974.*

NTIS: BNWL-1850 PT3

Convective storm scavenging experiments in the St. Louis area during July 1973 are described. A grid of collectors which extended from 2-52 km downstorm or east of the St. Louis arch was established to achieve closer-in sampling of the city s pollution plume and greater capability for capturing a large portion of the plume during spatially extensive rainfall. During about a 3-week field period, nine storms were sampled for which general information of precipitation sampling and times of radiosonde release are provided. Chemical analyses of the precipitation samples were completed for sulfur dioxide, sulfates, nitrites, nitrates, ammonium ion, and hydrogen ion. Further analysis of sample quality in terms of potential contamination, post-collection chemical reactions, and effects of ambient temperature is underway. The data from these storms, plus that collected from four storms in 1972, will form an important data base for the development and testing of convective storm models.

48018 **APTIC NO. 69471**

Daniels, Gerald M.

A COMPUTER PROGRAM FOR ATMOSPHERIC INFRARED TRANSMISSION AND BACKGROUND CALCULATIONS. *Opt. Eng., 13(2):92-97, March/April 1974. 12 refs.*

A computer programs for atmospheric infrared transmission and background calculations is described. The program is designed for systems-oriented calculations of atmospheric transmission and emission for arbitrary atmospheres and atmospheric paths with good spectral resolution over the 8-25 micron spectral range. The basic data used in the program are tables of molecular absorption line properties (line strength, position, half-width, and ground state energy) and altitude profiles of atmospheric constituent densities for carbon dioxide, water vapor, ozone, carbon monoxide, nitrous oxide, methane, and nitric acid as well as thermal properties (pressure and temperature). A comparison of atmospheric transmission data with the computer program calculations shows excellent agreement, except at the highest platform altitude of about 30 km. The outputs of thhe program are atmospheric transmission and thermal emission as a function of wavelength from 8-25 micron for observer altitudes from sea-level to 30 km and for observation zenith angles from 0-90 degrees. The program is structured for a medium size computer with a memory capacity of 20,000 words.

48019 **APTIC NO. 70078**

Darby, Dennis A., Lloyd H. Burckle, and David L. Clark

AIRBORNE DUST ON THE ARCTIC PACK ICE, ITS COMPOSITION AND FALLOUT RATE. *Earth Planet. Sci. Lett., 24(2):166-172, Dec. 1974. 21 refs.*

Dust collected from snow samples on the Arctic pack ice approximately 500 km north of Alaska indicated lower fallout rates than previously reported for Arctic stations 1400 km to the east (3.3 and 14 micrograms/sq cm/yr, respectively). Either the lower frequency of southerly (off-shore) near surface winds at the sample sites off Alaska or the unknown influx of dust with upper level air masses could account for the difference in dust fallout. The airborne dust contribution to Arctic deep-sea sediments north of Alaska, however, amounted to 1% or less. A consideration of the clay mineralogy and biogenous components of Arctic dust favors a global or distant source for most of the dust, especially the fraction smaller than 2 micron. No obvious industrial components were detected in the dust. (Author abstract)

48020 **APTIC NO. 66734**

Dave, J. V.

A DIRECT SOLUTION OF THE SPHERICAL-HARMONICS APPROXIMATION TO THE TRANSFER EQUATION FOR A PLANE-PARALLEL, NONHOMOGENEOUS ATMOSPHERE. *California Univ., Livermore, Calif., Lawrence Livermore Lab., Atomic Energy Commission Contract W-7405-Eng-48, Rept. TID-4500, UC-11, 53p., June 17, 1974. 29 refs.*

NTIS: UCRL-51581

A direct method for solving the spherical harmonics approximation to the scalar transport equation for a plant-parallel, nonhomogeneous atmosphere is presented. The transport equation is the basic mathematical expression representing such processes as atmospheric scattering and absorption of solar and ground- reflected radiation which are important to the areas of photochemistry and remote sensing. The model under investigation is assumed to contain (besides air) absorbing gases such as ozone, aerosols, and a cloud layer or layers composed of water drops. It is further assumed that the model is illuminated by a monochromatic, unidirectional radiation from above and by isotropic, ground-reflected radiation from below. The discussion is restricted to the so-called axially symmetric anisotropic cases, i.e., to the transfer of the azimuth-independent component of the intensity.

48021 **APTIC NO. 69580**

Davis, W. E.

A SUMMARY OF CURRENT FINDINGS FROM THE ANALYSIS OF 1972 QUILLAYUTE SCAVENGING EXPERIMENTS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 111-114, April 1974.*

NTIS: BNWL-1850 PT3

The results of two in-cloud releases of tracer in two frontal storms at Quillayute, Washington are reported. Releases of indium and silver iodide on March 21, 1972 resulted in little or no deposition. Subsequent releases of silver iodide, indium, and the organic dye rhodamine were performed on March 31, 1972, and the feasibility of using rhodamine tracer for future in- cloud scavenging experiments was evaluated. Maximum values of the rhodamine tracer were at best five times above background; thus, some of the deposition was probably masked in the background values. Deposition of rhodamine was in an area and at a downwind position where it was not expected to arrive. The use of rhodamine as a tracer appears feasible, though the method of release (free release through a valve without a nozzle) leaves much to be desired. A recheck of the wind information as well as radar information is required to explain the deposition pattern observed on the second occasion.

48022 **APTIC NO. 69313**

Dibelius, N. R., George Touchton, and Thomas Kane

CALCULATED GROUND LEVEL CONCENTRATION OF POLLUTANTS FROM GAS TURBINE USING AN AIR QUALITY DISPLAY MODEL COMPUTER PROGRAM. *Preprint, American Society of Mechanical Engineers, New York, 13p., 1974. 9 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-32.)*

The calculated ground level concentrations of air pollutants from 11 gas turbine models are presented. These calculations were made using Charlotte, N. C. meteorological data. Four of these gas turbine models are simple cycle machines covering a range of size from 5050 hp to 65 MW and four are regenerative machines. Another three are combined cycle (STAG) machines, two machines having unfired and one having a fired heat recovery steam generator. The calculations were made using a slightly modified version of the U. S. Environmental Protection Agency s Air Quality Display Model Computer Program. The ground level concentration of pollutants from gas turbines was quite low compared to ambient air quality standards. These low levels result because the gas turbine effective plume rise is high, due to high exhaust velocity and high exhaust temperature. As a result, the siting problems of gas turbines due to impact on ambient air quality are generally less than the siting problems of other power generating equipment. When multiple machine power blocks are employed, the ground level concentration of pollutants can be substantially reduced by increasing the stack height, grouping the gas turbine exhausts to increase the total mass and heat transport, or a combination of both. (Author abstract modified)

48023 **APTIC NO. 68521**

Droury, A.

PRINCIPLES OF THE LOGICAL ANALYSIS OF THE PROBLEMS OF PHYSICAL TRANSFERS OF POLLUTANTS IN FLUID MEDIA (AIR AND WATER). *(Principes de traitment logique des problemes de transferts physiques de polluants en milieu fluide (air et eau)). Text in French. Bull. Inform. Sci. Tech. Commiss. Energ. At. (Fr.), no. 191:31-39, April 1974. 11 refs.*

Based on the published literature, a generalized procedure for the analysis of problems of the physical transfer of pollutants which are suspended in air or water is developed. This deterministiic apprach deals separately with advection, diffusion, sources and sinks. The diffusion equation is solved by a Gaussian distribution, with variable coefficients which are obtained experimentally. The fundamental equation is based on the instantaneous point emission; it confers flexibility on the model thus obtained, and makes it possible to solve almost all problems that are likely to arise; either locally, regionally, or over very large distances (e.g., oceans). The necessary calculations require only a minimum of computational facilities.

48024 **APTIC NO. 69392**

Ehhalt, D. H., L. E. Heidt, R. H. Lueb, and N. Roper

VERTICAL PROFILES OF CH4, H2, CO, N2O, AND CO2 IN THE STRATOSPHERE. *Preprint, American Geophysical Union, 19p., 1974. 10 refs. (Presented at the American Geophysical Union, Annual Meeting, 55th, Washington, D. C., 1974.)*

On Sept. 9, 1973, a newly developed, cryogenic sampling system was flown aboard a balloon to a 30 km altitude over Palestine, Texas. Stratospheric air samples of 5 to 10 l STP were collected at eight different altitudes. These large samples allowed measurement of the carbon monoxide, nitrous oxide, and carbon dioxide concentrations, in addition to the measurement of methane and hydrogen. The resulting vertical profiles of the trace gases are reported and discussed. Experimental and theoretical profiles were compared. (Author abstract modified)

48025 **APTIC NO. 69567**

Elderkin, C. E., D. C. Powell, G. H. Clark, and P. W. Nickola

COMPARISON OF DIFFUSION-DEPOSITION MODEL COMPONENTS WITH EXPERIMENTAL RESULTS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 38-44, April 1974.*

NTIS: BNWL-1850 PT3

Estimations of crosswind integrated exposure are made with the Hanford diffusion-deposition model using a measured vertical velocity spectrum and a Hay-Pasquil beta value from the analysis of concurrent turbulence data. The crosswind integrated exposures of both depositing and nondepositing tracers are modeled reasonably well by the measured spectrum and an experimentally indicated beta value of 8, although both these components differ significantly from the model-derived values. Modeling of turbulence spectra underway in ongoing turbulence studies is consistent with the spectrum observed during the present experiment and is leading to an improved turbulence description in the diffusion-deposition model. Ongoing measurement of spatial and temporal turbulence correlations should also provide the needed improvement in the model s description of beta as a function of stability. More information is required regarding diffusivities of momentum and matter of various surface canopy types and pollutants materials for a thorough description of deposition. (Author abstract modified)

48026 **APTIC NO. 70082**

Ernst, John A.

AFRICAN DUST LAYER SWEEPS INTO THE SOUTHWEST NORTH ATLANTIC AREA. *Bull. Am. Meteorol. Soc., 55(11):1352-1353, Nov. 1974. 3 refs.*

A satellite photograph showing arrival of Saharan dust over the southwest North Atlantic area and the east coast of Florida is discussed. Dust layer intrusions from the African Continent have been recorded previously, but perhaps with not quite the visual impact that the high resolution view Synchronous Meteorological Satellite provides. The dusst layer may have acted as a shield in absorbing and scattering a portion of the solar radiation that would, when unimpeded, have contributed to the growth and maintenance of a land-sea temperature differential necessary for the sea-breeze front, and may have caused suppression of cumulous cloud convection over Cuba, the Bahamas, and part of Florida s Atlantic coast due to the sea-breeze front. Further study of the data may show a relationship between the possible stabilizing influence of the dust layer and the decrease of hurricane births in the Carribean and Mid-Atlantic Oceans.

48027 **APTIC NO. 69543**

Fabrick, A. J., P. I. Nakayama, and E. J. Fredricksen

A METHODOLOGY FOR TREATING LARGE LOCALIZED EMISSIONS OF REACTIVE POLLUTANTS (FINAL REPORT). *JRB Associates, Inc., La Jolla, Calif., Environmental Protection Agency Contract 68-02-1238, Program Element 1AA009, Rept. EPA-650/4-74-006, 139p., Feb. 1974. 5 refs.*

A numerical model for calculating the trajectories and concentrations of reactive pollutants emitted from localized sources is presented. The model employs the solution of the full three-dimensional Navier-Stokes equations along with the solution of the species density equation by summing over Lagrangian mass points. The mass points are transported by the mean wind field and moved with a random walk technique that simulates the turbulent diffusion. The effect of chemical reactions are modeled by reweighing the Lagrangian mass points. The equations are solved for regions of space where terrain features or buildings may cause strong distortions in the flow field. The numerical techniques are verified by comparisons with analytical formulas, including the boundary layer above a plate and the Gaussian plume. Using a simplified inorganic photochemical reaction model, the method is used to calculate photochemically reacting plumes. The numerical model shows promise of being able to assess the impact on air quality of point source emissions over complex terrain. Furthermore, with the incorporation of a valid photochemical reaction kinetics module, the model can be used to construct a parametric study of various plumes in order to quantify the errors introduced by regional models in averaging point sources over large areas. (Author abstract modified)

48028 **APTIC NO. 70294**

Fortak, H.

APPLICABILITY OF DISPERSION MODELS FOR CONSERVATION OF CLEAN AIR. *(Anwendungsmoeglichkeiten von Ausbreitungsmodellen in der Luftreinhaltung). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 164-169. 2 refs. (June.)*

Dispersion (or transmission) models permit the mathematical calculation of immissions from the knowledge of the emissions and the meteorological transmission conditions. Such models are the most important aid for solving immission oriented planning tasks. The dispersion or transmission model can be applied in all cases where an emission inventory is already available and also in cases where a certain allowable immission climatology has been set for which the emission inventory has yet to be compiled.

48029 **APTIC NO. 69760**

Fuji, Toru, Kiyoshi Imai, Atsuko Uenoyama, Masayoshi Okamoto, and Hiromi Yoshida

COMPARISON OF OZONE AND PARTICULATE MATTER LEVELS IN THE LOWER ATMOSPHERE. *(Taikichu ni okeru fuyu funjin to ozon no sogo- kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):174, Nov. 1974. 1 ref. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 27.)*

The correlation between ozone and suspended particulate levels is studied at offshore, shoreline, and inland atmosphere in the vicinity of Osaka. The correlation between levels in the lower atmosphere are quite different from that found in ground level studies. In offshore atmospheres, two pollutant levels had a positive correlation factor (0.59 at altitude of 540 m and around noon), while they had a negative correlation factor (0.0.03) in the inland atmosphere. This negative factor shifted to a smaller value when an onshore wind started to blow, indicating that both pollutants were being transported from the ocean inland.

48030 **APTIC NO. 69702**

Fujita, Takeo, Tadayoshi Furuya, and Hidemi Awata

DETERMINATION OF AIR POLLUTION DIFFUSION MODEL. *(Taiki osen kakusan moderu no kettei). Text in Japanese. Kyushu Kogyo Daigaku Kenkyu Hokoku (Kogaku) (Bull. Kyushu Inst. of Tech. Eng.), no. 29:119-123, June 1974. 2 refs.*

A simple diffusion model based on equations by Roberts and others was chosen and modified for examination of non-linear parameter determinations. The data used in the calculation of parameters were obtained from continuous observations in a given region. Five observation points were chosen in this region for application of the equations, showing air pollution diffusion behavior with respect to changes in wind velocity and wind direction. Some correspondence was found with the amount of air pollution material emitted.

48031 **APTIC NO. 69326**

Gandrud, B. W. and A. L. Lazrus

GLOBAL SURVEY OF STRATOSPHERIC SULFATE. *Preprint, National Center for Atmospheric Research, Boulder, Colo., 9p., 1974 (?).*

The sulfate aerosol layer in the lower stratosphere accumulates in a layer resembling similar layers formed by radioactive tracers. New evidence for the determination of this distribution predominantly by transport control is given. Distributions of the sulfate layer have now been obtained for two years between 75 deg N and 51 deg S. The concentrations in spring 1973 were considerably less than in spring 1971 or 1972, indicating that there had been an injection of volcanic material during this period. The concentration in spring 1973 was comparable to observations made over the central U. S. in 1967. Several balloon flights were completed in spring 1973 to altitudes as high as 37 km. Sulfate mixing ratios several times higher than those occurring below 24 km, that is within the sulfate layer, were observed. Both residence times and transport rates between hemispheres were significantly greater at these altitudes. Therefore, the persistence and extensiveness of this higher altitude sulfate should be determined because of its implications for supersonic transport emissions in the stratosphere. Recent data on the distribution of ammonium ion in the stratospheric aerosol are given, with their significance for interpreting the source of the aerosol. (Author abstract)

48032 **APTIC NO. 69469**

Ghosh, S. N. and V. Mitra

ORIGIN OF SODIUM IN THE ATMOSPHERE. *Indian J. Phys., 48(1): 1-10, Jan. 1974. 25 refs.*

The equilibrium concentration of free sodium atoms in the atmosphere is calculated from photochemical reactions, diffusion data, and the assumption that there is a constant influx of Na atoms from either the top or bottom side of the atmosphere. The calculations indicate that the Na atom influx is from the top of the atmosphere, i.e., sodium atoms are of extra-terrestrial rather than terrestrial sources. It is assumed that there is a constant current of Na flowing through all layers between 80 and 120 km, this assumption being true only when all Na atoms are released from interstellar dust of meteors. An analysis of the calculations indicates that atmospheric Na is of meteoric origin.

48033 **APTIC NO. 67106**

Gifford, F. A., Jr.

FURTHER COMPARISION OF URBAN AIR POLLUTION MODELS. *National Oceanic Atmospheric Administration, Oak Ridge, Tenn., Air Resources Atmospheric Turbulence and Diffusion Lab., Rept. 93, 9p., June 4, 1974. 10 refs.*

Results are presented from comparisons of the Air Resources Atmospheric Turbulence and Diffusion Laboratory Urban diffusion model with outputs of other models and with urban pollution data from Los Angeles County. Graphical plots are presented indicating the correlation of the predicted with the observed time pattern of carbon monoxide concentration from data averaged over eight CO sampling stations in Los Angeles County and the correlation of the predicted with the observed space pattern of CO concentration from data averaged over a 12-hour time period at each station. The simple ATDL model provides a reasonably high correlation of the space-averaged time concentration pattern as compared with most of the other models, but the hour-by-hour predictions of the simple model for each station exhibit considerably more variability than do all other models. A remedy is proposed involving the averaging of wind speeds for each hour over all stations prior to forming the time-pattern statistics and the averaging for each station over all hours prior to forming the space-pattern statistics. A correction is also presented to account for the diurnal march of stability in the simple ATDL model.

48034 **APTIC NO. 69957**

Habegger, L. J., T. D. Wolsko, J. E. Camaioni, D. A. Kellermeyer, and P. A. Dauzvardis

DISPERSION SIMULATION TECHNIQUES FOR ASSESSING THE AIR POLLUTION IMPACTS OF GROUND TRANSPORTATION SYSTEMS. *Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div., Atomic Energy Commission Contract W-31-109-Eng-38, Illinois Inst. for Environmental Quality Subcontract 31-109-38-2517, Rept. ANL/ES-29, 100p., April 1974. 38 refs.*

Documentation is provided for the development of air dispersion simulation techniques for assessing the air pollution resulting from roadway vehicle emissions. Various mathematical models for air pollution dispersion are surveyed and evaluated in terms of their applicability to the estimation of pollutant concentration in the vicinity of roadways. The Gaussian steady-state plume model appears to be effective for the prediction of air quality impact of highway vehicle pollutant emissions and is validated for regions less than 500 ft from the downwind edge of both an at-grade roadway and a depressed roadway. The model is sensitive to the assumptions for initial dispersion in the roadway vicinity, and satisfactory agreement between measured and computed estimates of roadside carbon monoxide concentrations are obtained by assuming uniform dispersion over the roadway (box model) and a Gaussian plume with finite initial dimensions originating from the downwind edge of the roadway. The calibrated Gaussian model is used to formulate techniques for estimating the annual 1-hour and 8-hour maximum concentrations resulting from roadway emissions, with the 8-hour emissions being based on a 5-year statistical analysis of airport weather data. Appendices provide a compilation of data from the experimental field studies as well as a documentation of the computer program that was developed for the Gaussian steady-state dispersion simulation.

48035 **APTIC NO. 70274**

Halpern, Paul, J. V. Dave, and Norman Braslau

SEA-LEVEL SOLAR RADIATION IN THE BIOLOGICALLY ACTIVE SPECTRUM. *Science, 186(4170):1204-1208, Dec. 27, 1974. 14 refs.*

Numerical simulation is used to estimate the effect of changes in aerosol characteristics on direct solar plus diffuse sky radiation flux received at sea level in the spectral region from 0.29 to 0.06 micron for constant ozone conditions. A significant depletion of ultraviolet and visible radiation due to absorption and scattering by particulates and cloud drops is demonstrated. Urban areas in particular appear to be subjected to significantly smaller doses of ultraviolet and visible radiation than those computed from atmospheric models with Rayleigh scattering only. Since a large fraction of the ultraviolet radiation received at the ground is in the form of diffuse skylight, the relationship between the amount of stratospheric ozone and solar energy received at the surface depends on several parameters, including the height and size distributions of aerosol and water drop clouds. Thus, a comprehensive radiation transfer study involving stratospheric compositions and possible conditions likely to be encountered in the troposphere is necessary to evaluate the biospheric effects of a supersonic fleet.

48036 **APTIC NO. 69586**

Hane, Carl E.

CONVECTIVE STORM MODELING AND ITS POSSIBLE APPLICATION TO PRECIPITATION SCAVENGING PROBLEMS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 143-146, April 1974.*

NTIS: BNWL-1850 PT3

The use of numerical convective cloud modeling in precipitation scavenging research is discussed, and a particular two-dimensional time-dependent squall line model is described which includes a parameterization scheme for the microphysics of cloud and rain. The two-dimensional model calculates as a function of time and space the air motion, temperature, and mixing ratios of water vapor, cloudwater, and rainwater. Condensation and evaportion plus associated heating and cooling are taken into account along with the sub-grid scale turbulent mixing between cloud and environment. The Marshall-Palmer distribution of drop sizes is assumed so that the fall speed of rainwater is a weighted mean for that distribution and depends on rainwater mixing ratio only. Significant features of the model s output include: stream function, rainwater mixing ratio, temperature anomalies, and vertical wind speed. The starting point for introducing scavenging into such a model might be the introduction of a plume at various locations within the two-dimensional domain and either allowing or not allowing interaction with cloud droplets and/or raindrops.

48037 **APTIC NO. 70110**

Hoffert, Martin I.

GLOBAL DISTRIBUTIONS OF ATMOSPHERIC CARBON DIOXIDE IN THE FOSSIL-FUEL ERA: A PROJECTION. *Atmos. Environ., 8(12):1225-1249, Dec. 1974. 37 refs.*

A model describing latitudinal mixing and accumulation of carbon dioxide in the atmosphere over the entire (projected) fossil-fuel era of human history out in the absence of climatic feedback is developed, including a new formulation of the oceanic sink term based on the tendency of atmospheric concentrations toward chemical and phase equilibrium with carbonic acid reactions in the deep oceans. For a Gaussian fuel consumption cycle wherein all potentially recoverable fossil reserves are eventually burned, the model predicts a doubling in global carbon dioxide -- above a pre-industrial level of approximately 300 ppm -- by the year 2025, and a five-fold increase about 200 years from now. Some latitudinal asymmetry in ambient concentration is generated by anthropogenic sources which predominate in the northern hemisphere at peak emission rates. At most, a difference of some 20 ppm is predicted between the hemispheres, much less than the changes which can be induced in global-mean concentrations by fossil fuel burning over the coming century. While projected increases in CO2 levels will be largely reversible within the next 10 years, they will become increasingly less so as the carbonic acid equilibrium of the oceans is shifted. The qualitative effects of climatic feedbacks and the relationship of the present work to a more general model for climatic change are also discussed. (Author abstract)

48038 **APTIC NO. 69509**

Hofmann, D. J., J. M. Rosen, and T. J. Pepin

GLOBAL MEASUREMENTS OF THY TIME VARIATIONS AND MORPHOLOGY OF THE STRATOSPHERIC AEROSOL. *Wyoming Univ., Laramie, Dept. of Physics and Astronomy, Office of Naval Research Contract N00014-70-A-0026- 0005, Rept. GM-18, 50p., Feb. 1974. 8 refs. (Presented at the Climatic Impact Assessment Program, 3rd Conference, Boston, Mass., Feb. 25-March 2, 1974.)*

Time variations and spatial distribution of the global stratospheric aerosol were studied using the results of over 70 balloon soundings conducted in 1972-1973 from 10 stations situated in the latitude from 85 degrees N to 90 degrees S. A simple seasonal variation below 20 km altitude was observed at northern midlatitude which results in a maximum total aerosol loading in winter and a minimum in summer. A high correlation with tropopause height is observed. Asymmetries in the global seasonal variation can be explained in terms of the tropopause height variation affecting the stratospheric volume available for aerosol formation and transport. Above 20 km, no seasonal variation is evident and the natural production processes are almost in equilibrium with loss processes. The lifetime of matter injected below 20 km will be relatively short with an annual average of about 6 mo, while above this altitude liftimes could be considerably longer. Synoptic studies in the or northern hemisphere are used to construct latitudinal cross sections of aerosol mixing ratio versus height. Some of these stratospheric layers appear to be associated with transport through the tropopause at midaltitudes, while other tropospheric layers appear to be associated with volcanic activity. (Author abstract modified)

48039 **APTIC NO. 70109**

Hogstrom, Ulf

WET FALLOUT OF SULFUROUS POLLUTANTS EMITTED FROM A CITY DURING RAIN OR SNOW. *Atmos. Environ., 8(12):1291-1303, Dec. 1974. 8 refs.*

An experiment to study the wet fallout of sulfurous compounds released during rain or snow fall from a geographically restricted area, the city of Uppsala, Sweden, is presented. Eight tests, with 100 sampling points in each and a maximum sampling distance of 60 km from the source were performed. Well-defined, but complex fallout patterns of sulfate and of free hydrogen ions were obtained. Quantitative analysis of these patterns was used to determine the characteristic scale of this fallout, which generally was in the range of 50-100 km. Almost all of the sulfur was deposited as sulfate -- only an insignificant amount was deposited as sulfur dioxide fairly close to the source. (Author abstract)

48040 **APTIC NO. 67163**

Holzworth, George C.

CLIMATOLOGICAL DATA ON ATMOSPHERIC STABILITY IN THE UNITED STATES. *Preprint, American Meteorological Society, 23p., 1974. 6 refs. (Presented at the American Meteorological Society Symposium on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., Sept. 9-13, 1974.)*

Routine rawinsonde measurements, made daily by the National Weather Service for scheduled synoptic observation times of 0000 and 1200 GMT, were analyzed to determine temperature inversion and temperature lapse conditions in the lower 3 km of the atmosphere. The objective method for analyzing stability conditions determined from the rawinsonde observations is presented and used to simplify multiple or complex inversions. Summaries are presented of inversion conditions (base height, thickness, and variation of temperature with height) and, when no inversion occurred below 3 km, of variation of temperature with variation of height in specified layers. In all, ten categories of values of variation of temperature with height are used. The categories and summarization techniques are suitable for analysis of rawinsonde observations throughout the world. Examples of tabular summaries for three stations in the U. S. and isoplethed maps of several stability parameters are presented and discussed. These data should be of interest to persons concerned with climatological aspects of dispersion in the lower layers of the atmosphere. (Author abstract modified)

48041 **APTIC NO. 69510**

Horie, Y.

A GENERAL ROLLBACK MODEL FOR REGIONAL AIR POLLUTION CONTROL PLANNING. *Environ. Plann. A, vol. 6:215-228, 1974. 17 refs.*

A more general form of proportional model is derived from the steady-state dispersion equation. Since the model is based on the diffusion model, it can take into account diffusion effects of stack height and spatial distribution of sources. The model, however, does not require as much input data and complex computations as does a diffusion model. In addition to the good features of a proportional model, namely, minimum input requirement and ease of handling, the model explicitly interrelates percentages and amounts of emission reduction with the resulting improvement in air quality. It is applicable for multicategory emission-source situations (for example industrial-residential emission sources) as well as for single- category emission situations (for example automotive emission sources). In the process of model formulation, a number of new parameters such as growth factors and relative transfer coefficients are introduced, and values of some of these parameters are determined. Several numerical examples are given to illustrate computational procedures and to indicate uses of the model in air pollution abatement. Verification of the simple rollback model is given in an appendix. (Author abstract)

48042 **APTIC NO. 69478**

Horst, T. W., J. G. Droppo, and C. E. Elderkin

AN ASSESSMENT OF THE LONG-TERM EXPOSURE DUE TO RESUSPENSION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3: Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 223-227, April 1974.*

NTIS: BNWL-1850 PT3

A simple model of the interaction between an airborne pollutant and the underlying surface was postulated. It includes the processes of deposition, fixation by the soil, resuspension and redeposition. This model was used to calculate the ratio between the exposure to the resuspended material and the exposure to the primary material. Utilizing current estimates of model parameters, this ratio could range from 5 to .0001. When resuspension is locally balanced by redeposition, this range is narrowed to .5 - .05. Horizontal homogeneity is a sufficient condition for this balance to hold true. (Author abstract modified)

48043 **APTIC NO. 69571**

Horst, T. W.

A SURFACE FLUX MODEL FOR DIFFUSION, DEPOSITION AND RESUSPENSION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 63-67, April 1974.*

NTIS: BNWL-1850 PT3

A computer program model of the diffusion-deposition-resuspension transport process is developed which accounts for the effect of deposition and resuspension on the airborne concentrations of tracer of pollutant material by representing the net vertical flux of the material at the surface (due to these processes) as an areal source of material for further downwind diffusion. The diffusion process is modeled by the standard Gaussian plume, and this model is used to show that the assumptions of the source depletion model of deposition overestimate surface air concentrations and, hence, the deposition flux by factors of two to four for moderately strong deposition. These results can be used to define the limits within which the source depletion model may be used with acceptable accuracy. The model calculations are exact for an infinite line source and closely approximate the crosswind-integrated concentrations from a point source. (Author abstract modified)

48044 **APTIC NO. 65183**

Hoult, David P.

SPRAY POND FOG AND SALT DEPOSITION. *Preprint, Air Pollution Control Assoc., 28p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-10.)*

During the past several years, interest has grown in the use of salt water spray canals to cool power plants situated on the seacoast. In the northeast United States, due to the cold weather, such installations may produce fog. If the spray canal operates with salt or brackish water, salt may also be deposited downwind of the canal. The aerodynamics of spray canal plumes, the fogging calculations, and the salt calculations are discussed. Heat transfer from the canal to the air and a theory describing the buoyant plume generated in the air by this heat transfer are described. Methods are presented for predicting the length of visible fog and the amount of salt deposited. A laboratory model of such a plume is discussed. Calculations for a typical power plant are presented. Theoretical, laboratory, and field results are described. (Author abstract modified)

48045 **APTIC NO. 65518**

Hoydysh, Walter G., R. A. Griffiths, and Y. Ogawa

A SCALE MODEL STUDY OF THE DISPERSION OF POLLUTION IN STREET CANYONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1974. 10 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-157.)*

Measurements of pollutant dispersion and flow patterns within an idealized model city were conducted in a wind tunnel. Test conditions were chosen to investigate the importance of upwind boundary conditions and the horizontal extent of the urban model. Upwind conditions were important if the model is sufficiently extensive. The concentration and velocity data, together with selected smoke visualization tests, revealed the major flor patterns and their relations to building density and height. Large vortices generated at the building edges dominated the flow field. High building density not only increases the overall concentrations, but causes pockets of high concentration to form near the building corners. High-rise structures provide beneficial ventilation, which can be maximized by scattering the high-rises, rather than grouping them. (Author abstract modified

48046 **APTIC NO. 69988**

Ingram, Gregory K., Gary R. Fauth, and Eugene A. Kroch

TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL, VOL. 2, PROGRAM USER S GUIDE (FINAL REPORT). *Harvard Univ., Cambridge, Mass., Dept. of Transportation Contract DOT-OS-30099, Rept. DOT-OS-30099-6, 199p., 1974. 20 refs.*

NTIS: PB-232 934

A user s guide to the Transportation and Air Shed Simulation Model (TASSIM) is presented. The TASSIM model can simulate oncentrations of carbon monoxide, hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter in as many as 200 distinct zones within a metropolitan area. The conceptual framework of the model consists of three major components: a transportation submodel, an emission submodel, and an air diffusion submodel. The guide describes the computer programming steps in the model, the input data required by various subprograms, and the procedures used to calibrate the model to a metropolitan area. The programming changes needed to simulate various policies and a listing of the model s FORTRAN code are outlined. When solved as a computer simulation model, TASSIM forecasts air pollutant concentrations from large stationary sources and the distribution of travel and generation of mobile emissions and small stationary sources. It displays air quality levels on computer maps. (Author summary modified)

48047 **APTIC NO. 66880**

Iwamoto, S.

THE MEASUREMENT OF PLUME RISE AND DISPERSION BY YAG LASER. *Proc. Inst. Laser Radar Conf., 6th Conf.• Laser Atmos. Stud., Sendai, Japan, 1974, p. 147-148. (Sept. 3-6, Paper VIII-8.)*

A YAG lidar (laser radar) was designed to perform scanning techniques. It was used to measure plume rise and dispersion from a 150-meter steam power station stack. The lidar was set at a distance of 850 m from the stack and directed at the plume. The collected data were compared with values from existing diffusion formulae. Bosanquet s and Holland s formulas overestimated plume rise height. The mean vertical spread of the plume can be estimated with segment vertical scans at constant horizontal direction.

48048 **APTIC NO. 69930**

Johnson, F. S.

CARBON DIOXIDE IN THE ATMOSPHERE. *In: Semiannual Status Report to National Aeronautics and Space Administration. Texas Univ., Dallas, NASA Grant NGL 44-004-026, NASA-CR-138651, p. 1-9, 15, Jan. 11, 1974.*

NTIS: N74-26867

Carbon dioxide occurs in great quantities in carbonate rocks and oceans. Much less occurs in the atmosphere because the CO2 is gradually being removed to the rocks and oceans. It is estimated that 3 times 10 to the 16th power g carbon per yr is transferred from atmospheric carbon dioxide to organic material by photosynthesis. Were it not for the decay of organic material and weathering of rocks, the CO2 content of the atmosphere would be greatly reduced within a few decades by photosynthesis. The natural sources and sinks for CO2 are reviewed. The burning of fossil fuels has caused an increase of 6% CO2 since the beginning of the century, and is causing an annual increase of 0.8 ppm. The increased warmth of the earth s surface due to the greenhouse effect of CO2 from fossil fuel combustion is small.

48049 **APTIC NO. 65182**

Juris, Kenneth

THE THERMAL PERFORMANCE OF NATURAL DRAFT COOLING TOWERS AND INFLUENCES ON PLUME SOURCE STRENGTH. *Preprint, Air Pollution Control Assoc., 19p., 1974. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-9.)*

Water evaporation rates and exit air temperatures from closed-cycle natural draft cooling towers can vary significantly during the year. Cooling tower plume dispersion models need to take these variations into consideration to provide realistic simulations. A computer program was developed to enable these parameters to be estimated as a function of time of year. The program may be used to provide basic input for any subsequent plume modeling program. The computer program employs basic material and energy balances and requires basic climatological information for a site in addition to the usual cooling tower parameters. The climatological information required includes the dry bulb, dew point, and source water temperatures as a function of time of year. Tower parameters required as input are circulating water flow rate, condenser delta T, cycles of concentration, height, top diameter, and base diameter. The program output includes cold water exit temperatures, water evaporation rate (source strength), makeup flow rate, blowdown flow rate, and exit air temperatures. A sample set of results for a northeast site location is presented. (Author abstract)

48050 **APTIC NO. 69718**

Kimoto, Mashito, Motohide Murata, Yoshimasa Kaizu,
Hirohisa Shima, Yoshihisa Nagai, and Hozumi Tamura

THE FOLLOW-UP STUDY FOR THE YOKKAICHI AREA SULFUR OXIDES DISPERSION CALCULATION. *(Yokkaichi chiiki ni okeru io sankabutsu ni kakaru taiki kakusan keisan no afta kea ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center), no. 2:82-84, March 1974. 1 ref.*

A follow-up study of the calculation of sulfur dioxide dispersion in Yokkaichi made in 1971 was conducted a year later to see whether the same dispersion equation and parameters were still applicable to the varying emission factors and weather. As the subject of dispersion calculation, public baths were selected as they were in the previous year, since they use only fuel oil. The baths with extremely low fuel consumption were eliminated. As a result, the subjects were 585 baths and 437 stacks, and the fuel consumption for the period was 4,370,000 tons and the total sulfur dioxide emission was 68,651 tons. The wind direction frequency was NW 22.5% of the time, and calm 5.3% of the time. The average wind velocity was 4.2 m/sec. As in the study of 1971, the Holland equation was used for the calculation of effective stack height, and the Ito s long-term mean equation was used for air dispersion. The same parameters were used. The area was divided by 1 km mesh and calculations were made for each cross-section. The SO2 dispersion calculation and PbO2 actual measurements had a correlation of 0.79, which was slightly lower than the previous year.

48051 **APTIC NO. 69761**

Kitamura, Moritsugu, Yasuuki Nakajima, Takatoshi Tajima,
Hiroyoshi Kawashima, and Takeo Shoda

INVESTIGATIONS ON THE ATMOSPHERIC SCAVENGING MECHANISMS: 1--THE RELATIONSHIP OF SULPHER DIOXIDE CONCENTRATION OF THE ATMOSPHERE TO THE CHEMICAL COMPOSITION OF PRECIPITATION. *(Taiki no joka sayo ni kansuru chosa kenkyu (dai k-ho) kosui no seibun to taikichu aryusan gasu nodo tono kankei). Text in Japanese. Taiki Osen*

Kenkyu (J. Japan. Soc. Air Pollution), 9(2):177, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 30.)

Atmospheric sulfur dioxide can be removed by rain precipitation and the SO2 scavenging mechanism is studied. The atmospheric SO2 level was low whenever a larger precipitation occurred. The amount of SO2 in the rainfall is calculated from the measured sulfate concentration in the rain sample. An SO2 mass balance was made for the total SO2 emitted from surrounding industries in Kanazawa area. About 20% of atmospheric SO2 was removed by rainfall.

48052 **APTIC NO. 69865**

Komeiji, Tetsuhito, Tadashi Sawada, and Toshio Oodaira

INVESTIGATION OF RAINFALL COMPONENTS. *(Amamizu seibun chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):175, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 28.)*

Rainfall characteristics are studied at six stations in Tokyo. The pH, electroconductivity, sulfate, nitrate, and chloride ion concentrations of the rainfall are measured. The data are compared with the amount of rainfall accumulated during the investigation period. More acidic rainfall (pH 3.0 to 3.9) was often found in suburban areas rather than in industrial areas. Higher electroconductivity and sulfate concentration were observed in center city. With the accumulation of rainfall, the pH tended to more acidic, and also the nitrate concentration as well as electroconductivity decreased.

48053 **APTIC NO. 69745**

Kondo, Heiichiro, Juro Kitamura, and Masafumi Kanematsu

AN ATTEMPT AT PREDICTION OF COMPOUNDED ENVIRONMENTAL AIR POLLUTION EFFECTS BY COMPUTER. *(Konpyuta o mochiita taiki osen no kankyo ni okeru fukugo koka yosoku no kokoromi). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 413, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 543.)*

The environmental effects of building a new factory were calculated by means of computer simulation. In particular, effects of wind direction (S, SE, E, N) on pollution emission (sulfur dioxide, nitrogen oxides) were calculated, using the Sutton diffusion equations.

48054 **APTIC NO. 69817**

Krouse, H. R.

SULPHUR ISOTOPE ABUNDANCE STUDIES OF THE ENVIRONMENT. *Preprint, Chemical Institute of Canada, Calgary Section, and Inorganic Chemistry Div., 11p., 1974. 11 refs. (Presented at the Canadian Sulphur Symposium, Calgary, Alberta, May 30-June 1, 1974.)*

The relative abundances of sulfur(32) and sulfur(34) are altered in terrestrial mass dependent processes. Consequently, emissions and effluents from industrial processes have inherent stable Oisotopic labels and their fates can be traced in our environment. In streams, lateral mixing can be quite slow, in which case individual sources of dissolved sulfate may be recognized in a cross-section. In the air of Alberta, sulfur oxides range widely in their sulfur isotope composition varies(delta S(34) from 7-28%). Although these data represent mainly contributions from the sour gas processing industry, temporal and spatial variations in the delta S(34) value attest to a significant biological component. Delta S(34) variations in vegetation show that lichens interact in a more direct fashion with atmospheric sulfur compounds than is the case for more complex plants. (Author abstract)

48055 **APTIC NO. 69716**

Kubo, Tomohiro

THE MYSTERY OF PHOTOCHEMICAL SMOGS. *(Kokagaku sumoggu no nazo). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):6-8, Feb. 1974.*

Several types of weather conditions usually considered as low risks for photochemical smogs deviated from the known patterns in Osaka. On August 6, a high oxidant concentration of 0.13 ppm occurred along the Neya River in Osaka at 1 pm, and 1 hour later, thunder struck the vicinity; one person died and several were injured. On the same day at noon, a thunder warning and a photochemical warning were simultaneously given in Kyoto. Usually, high oxidant concentrations occur on sunny or lightly cloudy days. But in Osaka, high oxidant levels often occur on completely cloudy days without any sunshine. The measurement was 0.13 ppm at 11 am on June 29, and 0.1 ppm or more at 12 locations on June 18, and 0.15 ppm at one location on the same day at noon. On July 29, a northeast wind was blowing all day. Usually, the oxidant concentration was low on windy days. The wind velocity was 5.5 m/sec even at noon, and oxidant was 0.18 ppm between 1 and 2 pm. In the Kanto Region, high oxidant concentrations appeared where the sea breeze stagnates or two sea breeze fronts meet. But in Osaka, the maximum concentration appeared within the sea breeze and topography seemed to affect the distribution of air masses. On July 30, the time of high oxidant in Nara basin and the time when the sea breeze entered into Nara Prefecture from the Osaka plain coincided. This suggests that a photochemical reaction probably occurred at the height of more than 1000 m, and oxidant moved from Osaka into Nara over the top of Mount Ikoma (642 m).

48056 **APTIC NO. 69672**

Lavery, Thomas F., Bruce A. Egan, and Robert M. Iwanchuk

THE NUMERICAL SIMULATION OF THE ADVECTION AND DIFFUSION OF A PLUME UNDER AERODYNAMIC DOWNWASH CONDITIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974 (?). 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., 1974, Paper 74-215.)*

Preliminary results of the numerical simulation of the advection and diffusion of an effluent plume under aerodynamic downwash conditions are presented. A numerical diffusion model simulated the pollutant transport resulting from effluent discharge from a short stack on top of a building. Three distinct flow regimes -- upwind of the building, in the cavity region lee of the building, and in the turbulent wake zone -- were parameterized based on the conservation of air mass and momentum and residence time experiments in the wind tunnel. The specification of the spatial distribution of winds and turbulent diffusivities represents a promising approach in predicting downwind concentrations when building produced turbulence influences the pollutant dispersion. Continuing wind tunnel experiments will provide detailed tracer gas concentration measurements for cross-sections of the plume trajectory, wind velocity data downwind of the building, the residence time of pollutants trapped in the cavity, and the range of critical wind speeds above which downwash will occur. Sample numerical calculations for various effluent exit velocities are presented. (Author abstract)

48057 **APTIC NO. 65215**

Leahey, Douglas M. and Richard D. Rowe

OBSERVATIONAL STUDIES OF ATMOSPHERIC DIFFUSION PROCESSES OVER IRREGULAR TERRAIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1974. 10 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-67.)*

Wind flow data with tetroons, helicopters, and bivanes are collected in order to study air flow over a mountain valley, over a long two-dimensional ridge, and over a river bank. The air flow behavior appears to be very different for each of the topographical features. Large vertical velocities were observed over the mountain valley. Air flow at high wind speeds over the long ridge was well approximated by potential stream lines. Parallel flow is an acceptable assumption for the wind patterns over the river bank. The derived diffusion coefficients were usually appreciably larger than expected based on Pasquill s classifications. The studies demonstrate the difficulties in generalizing about topographical influences on atmospheric dispersion potential. Future studies of near-plant plume diffusion should combine the observational techniques of time lapse photography and bivanes. A filming of marked plumes can yield data concerning plume elevations, while bivane information is useful in evaluating dispersion coefficients. Both cameras and bivanes can be used to gather sufficiently large quantities of data to provide statistically meaningful dispersion parameters.

48058 **APTIC NO. 69439**

Lee, Richard N. and Jeremy M. Hales

PRECIPITATION SCAVENGING OF ORGANIC CONTAMINANTS (FINAL REPORT). *Battelle Northwest Labs., Richland, Wash., Atmospheric Sciences Dept., Army Research Office Contract DAHCO4-72-C-0035, Proj. P-10417-EN, 104p., April 1974. 17 refs.*

Precipitation scavenging was evaluated as a mechanism for removal of trace organic gases and vapors from the atmosphere. The concentration of the moderately soluble materials ethylacetoacetate and diethylamine was determined for rain samples collected downwind of an elevated point source. These data are compared with concentrations calculated via the EPAEC gas washout model which incorporates meteorological data, source strength, the Gaussian plume model, and tracer solubility to predict tracer concentrations along the plume trajectory. Disagreement between the observed and calculated concentrations is attributed primarily to the quality of the tracer solubility data. (Author abstract modified)

48059 **APTIC NO. 69681**

Lewellen, W. S., M. Teske, and Coleman duP. Donaldson

TURBULENCE MODEL OF DIURNAL VARIATIONS IN THE PLANETARY BOUNDARY LAYER. *Heat Transfer Fluid Mech. Inst., 24th, Corvallis, Oreg., 1974, p. 301-319. 17 refs.*

The dynamics of momentum and heat transfer in the atmospheric boundary layer is analyzed using an invariant modeling technique to provide second-order closure of thye Reynolds stress equations. Spatially homogeneous boundary conditions are applied at the top of the boundary layer and at the surface where the heat flux is assumed to be cyclic in time, approximating conditions over the midwestern plains in the summer. Numerical results of the model show favorable comparison with field observations. Although the contribution of the time derivative term is small in the turbulence equations, there remain significant unsteady influences on the dynamics of the boundary layer through the relatively slow response of the mean velocities. The model is a step toward the improved prediction of diurnal variations in turbulent dynamics in the planetary boundary layer. Important features of the real atmospheric boundary layer which are not included in the model are: large scale scale terrain roughness, geostrophic wind variations, thermal wind, moisture transport between the surface and the atmosphere, and coupling of the surface temperature to surface heat flux through the soil energetics. A better means of quantitatively predicting the dynamics of turbulent convection of heat, momentum, and mass within the boundary layer can provide the basis for predicting when and to what degree air quality will be affected by the release of contaminants at given points. (Author abstract modified)

48060 **APTIC NO. 65520**

Lin, Jung-Tai, Hsien-Ta Liu, and Yih-Ho Pao

LABORATORY SIMULATION OF PLUME DISPERSION IN A STABLY STRATIFIED FLOW OVER A COMPLEX TERRAIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-161.)*

Laboratory simulations were conducted in a stably stratified towing tank to investigate the effects of stability and terrain on plume dispersion under extreme atmospheric conditions. A three-dimensional model was towed through the tank to simulate flow over complex terrain. The characteristics of plume dispersion were investigated using shadowgraph and dye visualization. Plume dispersion over a flat plate was used as a reference. The plume rise and spread increased as a result of the reduction of the local flow speed which is the upstream blocking phenomenon. The lateral spread near the upstream side of the ridge was enhanced significantly by the lateral flow around the terrain model. The accumulation of pollutants occurs in a semi-stagnant region just upstream and below the ridge. Downstream of the ridge, pollutants carried around and over the terrain model remain aloft for small internal Froude number, but are carried downward along the lee surface as the Froude number increases. The turbulent velocity and density of the plume were measured with hotfilm and conductivity problems. The normalized turbulent intensities and flatness factors of velocity and density fluctuation are approximately self-similar. (Author abstract modified)

48061 **APTIC NO. 65217**

Loveland, W. D., E. W. Hewson, and Y. S. Shum

THE USE OF ARTIFICIAL ACTIVABLE TRACE ELEMENTS TO MONITOR POLLUTANT SOURCE STRENGTHS AND DISPERSAL PATTERNS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 13 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-70.)*

A tracer technique using certain rare earth elements such as dysprosium, samarium, lanthanum, and cerium which can be neutron activated is presented for the analysis of air pollution problems. The method employing these stable activable tracers was applied to determine if the available meteorological dispersion models can be used effectively to monitor pollution emissions from selected industries in the vicinity of Albany, Oregon. The Gaussian plume model was satisfactory for the moderately intense turbulence fields which characterize Stability Types B, C, and D, including cases in which the pollution was trapped by an inversion layer aloft. For lower sources, however, it was necessary to make allowance for urban influences on plume dispersion. A box model best described the observed dispersal pattern when the upward penetration of the very intense turbulence of Stability Type A was limited by an inversion layer aloft. These meteorological models along with multiple regression analysis were applied using a blind experimental procedure to predict the emission rates of the effluent from multiple sources of air pollution in the Albany area. These techniques can be used to predict and hence to monitor the rate of emission within a factor of two for multiple sources consisting of three stacks. Using activable trace elements which naturally occur in a stack effluent rather than the artificial ones employed in the present study can extend the method to locate unknown or unsuspected sources of air pollution.

48062 **APTIC NO. 70099**

Lyon, W. S

DIRTY DAN CARBON RIDES AGAIN. *Radiochem. Radioanal. Lett., 20(1):1-5, Dec. 18, 1974. 7 refs.*

Increased coal burning in the future will produce increased amounts of carbon dioxide and particulate matter. The CO2 will be slowly removed by water and may cause changes in atmospheric temperature because of the greenhouse effect. Particulate matter in the atmosphere can affect backscattering radiation away from the earth and thus represent a cooling effect. Man-made particulates may increase backscattering and cooling. Carbon-14 dioxide tracer experiments could be used to elucidate CO2 exchange in sea water and to clarify the take-up and utilization of CO2 by plants and marine organisms. Carbon-14 is produced by High Temperature Gas Cooled Reactors, and could pollute the environment from this source.

48063 **APTIC NO. 69894**

Melfi, S. H., D. Bundy, J. Eckert, J. Guagliardo, and J. L. McElroy

BOUNDARY LAYER INVESTIGATIONS USING A DOWN-LOOKING AIRBORNE LIDAR SYSTEM. *Preprint, Environmental Protection Agency, Las Vegas, Nev., National Environmental Research Center, Environmental Protection Agency, Research Triangle Park, N. C., 3p., 1974.*

An example of one series of lidar measurements obtained during airborne lidar studies (10,000 ft altitude) over the St. Louis area designed to investigate mixing layer height and structure within the boundary layer is presented. The LIDAR system utilized a Q-switched ruby laser with a pulse energy of 1 joule and a telescope with a 16-inch acrylic fresnel lens. Firing interval was approximately 30 sec. Measurements were taken on four separate flights over the St. Louis area. Data on the boundary layer transition period were collected on three of the flights (evening, early morning, and mid-morning), while data on the position and dimension of the urban plume was collected on the fourth flight. Vertical profiles obtained with a helicopter-mounted nephelometer and temperature monitor confirmed the measurements of mixing height obtained with the LIDAR system. An example generated from 16 vertical profiles at approximately 1 mi apart (west and east flight) showed a decrease in scattering at approximately 2200 ft, which was interpreted as the height of a uniform mixed layer over the area. Two areas of relatively high scattering intensity, one over Wellston, Missouri and the other over East St. Louis, were also found.

48064 **APTIC NO. 65165**

Moore, D. J.

A COMPARISON OF THE TRAJECTORIES OF RISING BUOYANT PLUMES WITH THEORETICAL/EMPIRICAL MODELS. *Atmos. Environ., 8(5):441-457, May 1974. 16 refs.*

The trajectory of a plume of hot gas from a power station is well represented by the equation z equals AQ to the 0.25th power x to the 0.75th power/U where z is the rise above the source (m), Q is the rate of heat emission (MW), U is the wind speed at 1.5 stack heights (ms to the -1), and x(m) is a function of the distance downwind, atmospheric stability, and stack height. X is approximately equal to the distance downwind at distances up to a few hundred meters and approaches an asymptotic value of 1 km or more at large distances (i.e., of a few km) in unstable and near neutral meteorological conditions and of a few hundred meters at moderate distances (less than 1 km) with stable lapse rates. The value of A appeared to be about 2.4 for all plants with stacks of 120 m or more in height. For smaller stacks, in near neutral and unstable atmospheres, lower values of A appeared to be appropriate due to the greater turbulence at the stack top level and a tentative attempt is made to relate this value to the height of emission for this range of plant. The above-mentioned equation can be deduced from a lumpy model of the plume and gives marginally better agreement with observation than the continuous model, which predicts an exponent of 1/3 for Q and 2/3 for x. In deriving the equation the effect of initial vertical momentum is neglected, but this does not seem to give serious errors at distances greater than 400 m from the source. The expression as it stands is applicable to boiler plants. For plumes with much higher efflux velocities than, or very different initial density from boiler plants, some small modifications to the expression are required. (Author abstract)

48065 **APTIC NO. 69752**

Morita, Masatoshi, Hiroshi Nakamura, and Hideichi Mimura

ENVIRIONMENTAL POLLUTION BY CHLORINATED HYDROCARBONS. *(Ensokei tanka suiso ni yoru kankyo osen). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 310, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 424.)*

The amounts of different chlorinated hydrocarbons were determined by gas chromatography in water from various sources (atmosphere, rainfall, snow, well-water, river water, faucet water, raw sewage, and treated sewage). Hydrocarbons present included methylene chloride, trichloroethane, chloroform, trichloroethylene and tetrachloroethylene. The amounts of chloroform in faucet water was high, possibly because of the reaction of organic material with the chlorine added for bacteriacidal purposes. Trichloroethylene and tetrachloroethylene were present in large amounts in river water and sewage, but treatment can result in some disintegration. Well-water was comparatively pure, but well-water near a plating factory was very contaminated.

48066 **APTIC NO. 65519**

Mousson, Bernard, Pierre J. Bessemoulin, Marcel Hausard, and Jean C. Boulay

ATMOSPHERIC POLLUTION STUDY AND PREVISION OVER THE NEW TOWN OF SAINT-QUENTIN-EN-YVELINES IN FRANCE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-158.)*

An isochrometric technique based on hydraulic simulation was developed and applied to the new town of Saint-Quentin-En-Yvelines in France. The different characteristics of simulations in water tank: non-dimensional parameters, physical models, and water tank are described. The isochrometric method allows the isoplethes to appear directly over the model without the use of any probe. The main influence of topography, stack height, and meteorology in Saint-Quentin-En-Yvelines were analyzed. Agreement between modeling and theory is perfect when diffusion occurs over flat, slightly uneven country. However, plumes are quite different near or over complicated topography or highly varied relief. The technique is applied to defining existing industrial pollution; optimal siting of a new stack; height selection of a new stack; and preparing recommendations for optimum operating conditions of an existing stack. Applications of the modeling to other areas include: air quality studies of existing pollution, determination of optimal location of monitors integrated within a network of control and alarm, and visualization of the contribution of each industrial source with regard to conditions of meteorology and emission. (Author abstract modified)

48067 **APTIC NO. 65219**

Nagy, G.

A MATHEMATICAL MODEL FOR BUILDING HEIGHT LIMITATIONS IMPOSED BY MULTIPLE PLUME EFFECTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 16p., 1974. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-72.)*

A general purpose user-oriented computer program which seeks to answer the general problem of permit administration for sources of air pollution is presented, involving how to take into account the contribution of all existing sources while assessing the impact of each pronounced new facility. The basic Gaussian dispersion equation is used with an exponential decay factor for pollutant life, and empirical functions for plume width and depth based on curves by Turner. The program accesses two magnetic tapes; a basic master file tape containing all emission inventory information on each source, and a second tape containing daily emission rates appropriate as to season and day of week. The contribution of each source at a specified point within the inventory area is computed and the contributions are summed and output. Applications within the metropolitan Toronto emission inventory area with over 10,000 inventoried sources indicate that such a massive source by source approach is in fact feasible and practical from the point of view of cost in investigator man-hours and computer time. The limitations of such a simple model, its future development, and some practical applications are discussed.

48068 **APTIC NO. 69265**

Nakai, Nobuyuki, Naoko Takahashi, and Ushio Takeuchi

SULFATE ION SOURCE IN PRECIPITATION AND AIR POLLUTION. *(Kosuichu no SO4(-2) no yurai to taiki osen). Text in Japanese. Preprint, Geochemical Society of Japan, Tokyo, p. 68-71, 1974. (Presented at the Geochemical Society of Japan Study Meeting, Tokyo, Japan, Oct. 1-3, 1974, Paper A21.)*

The degree to which atmospheric pollution by manmade sulfur dioxide occurs can be inferred from the decrease in pH in rainfall. The increase of 32S (sulfur isotope 32) in rainfall, which indicates increased industrial pollution, is symbolized by the delta value for 34S (sulfur isotope 34) which would decrease correspondingly. By checking the delta 34S values in Tokyo from October 1971 to March 1973, it was seen how changes in the concentration of sulfur oxides were sensitively reflected in the rainfall. The paths taken by the nuclei for precipitation prior to arrival at the point of precipitation also contributed to change in delta 34S values. In the Tokyo-Nagoya region, the average annual sulfate concentration in rainfall due to artificial pollution was calculated to have increased from 40-50% (1960) to 70-75% (1973) of the total sulfate concentration.

48069 **APTIC NO. 69348**

Naugle, D. F.

DEVELOPMENT OF AN AIR FORCE AIR QUALITY ASSESSMENT MODEL (AQAM). *Air Force Weapons Lab., Kirtland Air Force Base, N. Mex., AFWL-TR-74-508, 12p., Sept. 1974. 10 refs. (Presented at the American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, Seattle, Wash., July 29-Aug. 1, 1974, Paper 74-ENAs-28.)*

A computerized Air Quality Assessment Model (AQAM) is being developed to better analyze the environmental impact of airbase operations. While most emphasis is placed on improving the accuracy of treating aircraft operations, nearly any municipal or industrial emission source can be analyzed. Emission calculations are performed within the model so that only detailed source activity information must be input. The general capabilities and structure of the AQAM are described. The short-term dispersion program is used to predict air quality concentrations resulting from specifically input meteorological conditions. The long-term program performs many more calculations than the short-term program. Ambient air quality can be predicted for hourly, daily, monthly, or annual averaging times of up to 10 pollutants. (Author abstract modified)

48070 **APTIC NO. 69380**

Newman, J. E., M. D. Abel, W. A. Bruns, and K. J. Yost

SOME ATMOSPHERIC TRANSPORT CHARACTERISTICS OF SUSPENDED PARTICULATES AND ASSOCIATED TRACE CONTAMINANTS AROUND THE SOUTH END OF LAKE MICHIGAN. *Preprint, Purdue Univ., West Lafayette, Ind., Dept. of Agronomy and Purdue Univ., West Lafayette, Ind., Dept. of Bionucleonics, 31p., 1974. 5 refs.*

Selected daily isopleths for total suspended particulate and associated trace contaminants around the south end of Lake Michigan are analyzed for atmospheric transport characteristics. It is possible to clearly isolate certain mesoscale atmospheric transport characteristics from single-day isopleth analysis. But, single-day isopleth analysis reveals only area source pollution levels, not point sources. Point source identification from atmospheric transport patterns can therefore be achieved only from accurate hourly meteorological data, in conjunction with known point source inventory strengths, and under environmental conditions that essentially eliminate refloatation from terrestrial surfaces. (Author abstract)

48071 **APTIC NO. 69568**

Nickola, P. W. and G. H. Clark

ESTIMATION OF MEAN CROSSWIND CONCENTRATION PROFILES FROM INSTANTANEOUS CROSSWIND TRAVERSES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 44-49, April 1974.*

NTIS: BNWL-1850 PT3

Detailed real-time concentration histories obtained from the use of krypton-88 tracer releases at 26 m permitted the simulation of aircraft crosswind traverses through a diffusing plume. The atmosphere was thermally stable, and wind speeds remained quite constant at 2.9, 5.3, and 6.8 mi/hr for elevations of 1.5, 15, and 30 m, respectively. The standard error of peak crosswind exposure estimation was in excess of 100% of the true value for a single traverse at either 800 or 1600 m from the source, though this error was reduced to 25-30% if six traverses were presumed to have been flown. Standard errors were about 40% and 15% for one and six traverses, respectively, for crosswind integrated exposures. For stabilities other than the one encountered during the present test, the efficiency of a given number of traverses as predictors will be likely to vary from those reported in the present experiment. (Author abstract modified)

48072 **APTIC NO. 69569**

Nickola, P. W. and G. H. Clark

MEASUREMENT OF PARTICULATE PLUME DEPLETION BY COMPARISON WITH INERT GAS PLUMES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 49-60, April 1974.*

NTIS: BNWL-1850 PT3

Results of 1972-1973 multi-tracer releases are reviewed in relation to the measurement of particulate plume depletion by comparison with inert gas plumes. The tracers were dispersed into the atmosphere from an elevation of 26 m. Fluorescent zinc sulfide showed a strong tendency to deplete in the near-ground layers, though problems in calibration of the tracer assay techniques complicated measurements of the depletion magnitude. Estimation of the zinc sulfide deposition was accomplished through comparison with the nondepositing inert gas tracer, krypton-85. The krypton displayed strong evidence of reflection from the ground in one of the three experiments performed. Release of zinc sulfide into an unstable atmosphere resulted in an estimated 1% of the particulate depositing before the plume reached 200 m. During one release into a stable atmosphere 0-1% of the tracer deposited during movement to 812 m, and from 3-6% of the particulate tracer deposited during traversal to 842 m during release into a less stable atmosphere. (Author abstract modified)

48073 **APTIC NO. 69882**

Okamoto, Shin ichi, Kiyoshige Shiozawa, and Atsushi Ootaki

A MATHEMATICAL MODEL FOR ESTIMATING AIR POLLUTION IN URBAN AREAS – APPLICATION OF A 2-LAYER MODEL TO THE CALCULATION OF SO2 CONCENTRATION. *(Sushiki moderu niyoru toshi taiki osen no suitei – SO2 nodo keisan eno niso moderu no tekiyo). Text in Japanese. Waseda Daigaku Rikogaku Kenkyusho Hokoku (Bull. Sci. Eng. Res. Lab., Waseda Univ.), no. 67:37-48, 1974. 19 refs.*

A multiple box model for air quality simulation was developed into a two-layer model in which the contributions from the elevated source neglected in the multiple box model are considered. The two-layer model consists of a multiple box model and an integrated puff model. It can simulate urban air pollution under episode conditions. Contributions from elevated point sources are calculated by Gaussian-type diffusion equations using upper level wind data. This model provides a more realistic simulation of calm conditions. It was applied to the estimation of sulfur dioxide concentrations in the Tokyo metropolitan area. All of the calculated 7-hour average SO2 concentrations at 10 stations were within + or - 0.06 ppm of the observed values.

48074 **APTIC NO. 69859**

Okita, Toshikazu

MECHANISM FOR THE FORMATION OF ACIDIC RAIN. *(Sansei ame no seisei kiko ni tsuite (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):176, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 29.)*

Calculation of the pH of acidic rain was attempted, based on the three possible mechanisms: sulfuric acid mist collision with raindrops, diffusion of the acid mist into raindrops, and total conversion of the acid mist into atmospheric water vapor. For example, calculation by the collision mechanisms gave the pH 4.47 and 4.20 for rainfall of 10 mm/hr and 1 mm/hr, respectively, when 10.8 micrograms/cu m sulfuric acid mist was presented. If total conversion was used for this same acid mist, a pH 3.37 for 0.5 g/cu m of atmospheric water vapor was obtained. To calculate the pH of acidic rain, parameters, such as size of the raindrop, number of sulfuric acid mist particles, and the oxidation efficiency of sulfur dioxide to trioxide as well as the evaporation factor of the raindrops, are important.

48075 **APTIC NO. 69411**

Orgill, M. M., G. A. Sehmel, and T. J. Bander

REGIONAL WIND RESUSPENSION OF DUST. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 214-219, April 1974.*

NTIS: BNWL-1850 PT3

The natural wind-caused airborne dust loadings over the country were determined through meteorological data. The National Weather Service reporting observations of dust and visibility were used to infer the approximate frequency and dust loadings for resuspension periods. Dust parameters for the period 1953-1970 are presented for the Hanford area. The total dust hours were 475 and the total dust days were 142. There were 150 dust storms which ranged in duration from 1-16 hr. The hours of dust occurrence, average visibility, and estimated average dust concentration are tabulated as a function of wind direction and speed. The average dust concentration during dusty period was approximately 7 mg/cu m.

48076 **APTIC NO. 70231**

Ota, Seizo

A METHOD OF SO2 AIR POLLUTION WEATHER FORECASTING IN OTAKE. *(Otake-shi ni okeru SO2 taiki osen kisho yo yoho no ichihoho ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:83-85, Feb. 1974.*

Prediction of pollution by three approximations was performed, using meteorological data obtained from April 1968 to March 1969 in Otake. The atmospheric pressure difference at 9:00 am and 9:00 pm was correlated. Three linear correlation equations were obtained, corresponding to high, medium, and low pressure difference at 9:00 pm. The first approximation was carried out by classifying pollution into four degrees and by employing the pressure difference concept. At pressure difference at 9:00 am (delta Pg) below 5.0 (mb unit) and that at 9:00 pm (delta P 21) below 2.5, the sulfur dioxide pollution was predicted to be the highest degree, while at delta P 9 greater than 10, it was predicted to be the lowest degree. The second approximation was carried out by dividing the wind direction into 16 azimuths followed by plotting with data from the first approximation. The third approximation was carried out using meteorological data obtained at Hiroshima city. The accuracy of the prediction was about 65%.

48077 **APTIC NO. 69699**

Oya, Fumihiko and Hideki Akiyama

THE HORROR OF INSIDIOUS ACIDIC RAIN. *(Shinobiyoru sanseiu no kyofu). Text in Japanese. PPM (Japan), 5(12):2-9, Dec. 1974.*

Atmospheric conditions for formation of acidic rain are described. In general, if sunshine results in photochemical smog, the rainfall that follows is acidic rain. Control measures include, first of all, determination and control of the pollution sources. Secondly, control measures should be enforced for the time period during which acidic rain could be formed. Thirdly, if possibility of damage is foreseen, warning should be given to minimize the effects.

48078 **APTIC NO. 67134**

Patterson, Robert M. and James R. Mahoney

TRAFFIC MOTION CONTROLS AS AN EMISSION CONTROL TECHNIQUE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-3.)*

The development and evaluation of new modeling and analysis tools for evaluating the effectiveness of traffic motion controls to reduce motor vehicle emissions in urban areas are discussed, with special application to congested local peak emission areas. The method is to build a traffic flow submodel which computes detailed information on individual vehicle motions (acceleration, deceleration, cruise, and idle) through a string of signalized intersections, each with its own characteristic input parameters including signal phase times, offset, approach speed, departure speed, and turning fractions. The computed vehicle motions are then combined with an emission sub-model which calculates emissions based on driving speed and mode for all vehicle motions. The emissions from each vehicle are added at all points along the roadway to calculate spatially and temporally detailed emission profiles. A field study was performed at an urban street intersection to collect data for preliminary testing of the emission profile model. Emission profiles were generated by a model simulation of the traffic and signal conditions observed during the study. These were then input to a street canyon dilution model to predict carbon monoxide concentrations to be compared with those measured at three locations near the intersection. The average difference between observed and calculated 1-hour values was -20%. For a 3-hour average, the difference was -14%. The emission profile model was then used to analyze the effects of setting the bandwidth of a signal progression proportionately to unequal opposing traffic volumes and then giving the largest possible bandwidth to the heavier volume. The local, peak emissions and the total emissions were reduced at two out of three intersections, with an overall reduction for all three. This analysis example is especially applicable to rush hour, when traffic flow is predominately in one direction. (Author abstract)

48079 **APTIC NO. 69564**

Powell, D. C.

A METHOD FOR DETERMINING MONIN-OBUKHOV L S FROM PROFILES OF SUBJECTIVELY ESTIMATED MEAN WIND SPEEDS AND TEMPERATURE. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 27-30, April 1974.*

NTIS: BNWL-1850 PT3

A method for calculating Monin-Obukhov L values independent of the heat and momentum flux measurements was developed using wind and temperature data obtained at heights of 7, 50, 100, and 200 ft. The computed L values were compared to L values derived from flux data from sonic anemometers, and the agreement was quite good for one unstable case and for one stable case. The estimates of L differed by an order of magnitude for a slightly stable case. An L value indicating definitely stable conditions was obtained from the gradient calculation method and appeared more credible than the nearly neutral L value obtained from a corrected sonic heat flux measurement that was positive in uncorrected form.

48080 **APTIC NO. 69565**

Powell, D. C.

DEPENDENCE OF SITE EVALUATION OF ROUGHNESS LENGTH AND DISPLACEMENT LENGTH ON VALUE CHOSEN FOR VON KARMAN S CONSTANT. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 30-32, April 1974.*

NTIS: BNWL-1850 PT3

A gradient calculation method for estimating Monin-Obukhov L values is extended to calculating values of the friction velocity by using sets of values of Von Karman s constant, roughness length, and displacement length. The criterion for validation is agreement of friction velocity values so calculated with those calculated from concurrent sonic anemometer data. The associated sets of values for roughness length and displacement length differ significantly when this procedure is performed using 0.35 or 0.40 for Von Karman s constant. The latter result indicates that a new value of Von Karman s constant should not be adopted for profile analysis of data for a particular site unless the roughness length and displacement length values assumed for the site are reevaluated. This information is to be used in diffusion-deposition models.

48081 **APTIC NO. 69566**

Powell, D. C. and T. W. Horst

POWER SPECTRAL ANALYSIS OF TWO PERIODS OF TURBULENCE DATA FOR VERY STABLE CONDITIONS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 33-38, April 1974.*

NTIS: BNWL-1850 PT3

Sonic anemometer data from heights of 60, 15, and 7.5 m were analyzed for two 55-minute periods of turbulence data for very stable conditions during which the critical Richardson number was attained at heights between 15 and 30 m. The best organization of the spectra was achieved by plotting dimensionless spectra, normalized by individual variances, as functions of dimensional frequency. For the less stable of the two periods, the spectra from the 60 m level organized well with the spectra from the lower levels except at the lower frequencies which were not included in the normalizing variances. The frequencies of maximum spectral energy at 15 and 7.5 m for the three components averaged less than 60% of the values predicted by previous modeling. The parameterization of the data achieved by using the dimensionless frequency of maximum spectral energy was not inferior to that using the dimensionless frequency in Kaimal s model.

48082 **APTIC NO. 67075**

Quickert, N., G. Dowd, and J. L. Monkman

A DEVICE FOR AIR POLLUTION MONITORING OF AIR EARTH CURRENTS. *Preprint, Environmental Protection Service, Ottawa (Ontario), Chemistry Div., 24p., 1974 (?).*

The electrostatic condition of the atmosphere is continually varying in reponse to weather changes. Since electric fields may reach exceedingly high values, it is possible that they exert an influence on chemical combinations in the air. An instrument is described which uses field effect input operational amplifiers to measure the magnitude and polarity of air earth currents. It is designed to operate in conjunction with air pollution monitoring equipment, in particular, ozone and oxides of nitrogen monitors. Correlations between the electrical measurements and the gaseous concentrations are discussed. There is evidence to suggest that air electrical phenomena can be correlated to O_3 ane NO_x production during thunderstorms. Accurate conduction measurements should yield valuable data from a pollution point of view. (Author abstract modified)

48083 **APTIC NO. 70262**

Raynor, Gilbert S., Maynard E. Smith, and Irving A. Singer

METEOROLOGICAL EFFECTS ON SULFUR DIOXIDE CONCENTRATIONS ON SUBURBAN LOND ISLAND, NEW YORK. *Atmos. Environ., 8(12):1305- 1320, Dec. 1974. 11 refs.*

Mean hourly sulfur dioxide measurements for the Lond Island suburban area situated east of New York City were statistically correlated with several meteorological variables monitored over a 2-year period. Sulfur dioxide concentrations above 200 ppm occurred under a wide range of meteorological conditions and were particularly related to westerly winds (from the New York metropolitan region). During the winter, concentrations averaged higher with light than with strong wind speeds, though during the summer no relationship with wind speed existed. Peak concentrations occurred with all gustiness classes examined, with average concentrations being higher for conditions representing either convective turbulence or a nearly complete absence of turbulence. Concentrations averaged lower during periods of precipitation. Concentrations advected from the New York City area exceeded local concentrations near the city boundary and became neglibile at a distance of about 100 km. The diurnal cycle showed a consistent pattern only with westerly winds. Sulfur dioxide levels were higher in the winter than in the summer, with most cases of high SO_2 levels occurring at temperatures between minus 10 and 10 C. Most cases of SO_2 episodes were better related to conditions in New York City than to conditions in the study area.

48084 **APTIC NO. 69553**

Reck, Ruth A.

AEROSOLS IN THE ATMOSPHERE: CALCULATION OF CRITICAL ABSORPTION ABSORPTION/BACKSCATTER RATIO. *General Motors Corp.,* *Warren, Mich., Physics Dept., Research Publication GMR-1576 (revised), 13p., Aug. 14, 1974. 11 refs.*

The ratio of absorption to backscatter coefficients for which heating and cooling effects due to aerosols exactly balance at the earth s surface was calculated using a radiative-convective atmospheric model. The results are compared with those obtained from several simpler mean radiative-transfer models. An aerosol layer in the atmosphere changes the radiative balance and produces two effects in the atmosphere: an increase in the mean earth-atmosphere albedo (a cooling effect) and a reduction in of the atmospheric radiative cooling (a heating effect). The aerosol backscatter of incoming solar radiation increases the earth-atmosphere albedo while the absorption increases the atmospheric temperature, thus reducing the net radiative cooling. (Author abstract modified)

48085 **APTIC NO. 70243**

Riehl, H., G. Frattesi, and H. Haug

PARTICULATE POLLUTION IN BERLIN DURING STAGNANT WEATHER SITUATIONS IN SUMMER. *Beitr. Physik Atmosphaere, 47(4):248-260, 1974. 11 refs.*

Normally, particulate pollution measured at the Meteorological Institute of Berlin has a single diurnal cycle on summer days. Pollution density is highest in the morning and lowest in the afternoon. On days with light wind and fair weather the diurnal decrease may vanish; then the highest afternoon pollution levels are recorded. These levels are not inversely correlated with the mixing depth but with the mean wind speed of the adiabatic layer. Contrary to the morning hours, no correlation with wind direction is evident. At wind speeds below about 2 m/sec observed pollution levels deviate significantly from the hyperbolic curve relating wind speed and pollution. Comparison of radiosondes taken in the city near noon and in the afternoon suggest that turbulence establishing uniform specific humidity continues even at very low mean wind speed. Further, gust velocities recorded at anemometer level (26 m) and averaged over the daytime hours exceed the strongest wind in the adiabatic layer at speeds below 10 m/sec suggesting the presence of mechanisms for turbulence additional to mean wind speed. An equivalent wind speed is defined on the basis of these observations which appears to give an improved presentation of pollution levels at very low mean wind speeds.

48086 **APTIC NO. 69792**

Rosenberg, Norman J. and Shashi B. Verma

CARBON DIOXIDE CONCENTRATION AND FLUX IN A LARGE AGRICULTURAL REGION OF THE GREAT PLAINS OF NORTH AMERICA. *In: Terrestrial Source and Sink Strengths for Atmospheric Carbon Dioxide in an Agricultural Region (Second Annual Report). Nebraska Univ., Lincoln, Dept. of Horticulture and Forestry, National Oceanic and Atmospheric Administration Environmental Data Service Contract 2-35385, Nebraska Agricultural Experiment Station Proj. 20-31, Regional Research Proj. 11-33, 28p., April 30, 1974. 19 refs.*

NTIS: COM-74-11304

Results of observations of carbon dioxide concentrations and flux in an area of typical agricultural land use in the east Central Great Plains of North America (Mead, Nebraska) are reported. The observations were made at sufficient height (concentration at 16 m; flux between 16 and 5.6 m) to represent an integration of CO2 fixation and release due to all types of land use in the region (pasture, alfalfa, and annual crops). Minimum daytime CO2 concentrations ranged from about 295-300 ppm in late July to early August (the time of apparent maximum photosynthetic activity) to 328-332 ppm in winter. The shape of the annual CO2 concentration wave at Mead is described and compared with those for Mauna Loa, Hawaii and Barrow, Alaska. Peak daytime flux of CO2 from the atmosphere to the ground ranged from 0.5 to 1.5-2.0 to 0.5 g/sq cm/sec times 10 to the -7th in early June, early August, and late September, respectively. The net daily CO2 flux, calculated from the downward daytime and upward nocturnal fluxes, was about 10-12 to 18-20 to 6-10 and 1-5 g/sq m in early June, early August (maximum), September, and early October, respectively. (Author abstract)

48087 **APTIC NO. 69793**

Rosenberg, Norman J. and Shashi B. Verma

VERTICAL PROFILES OF CARBON DIOXIDE CONCENTRATION IN STABLE STRATIFICATION. *In: Terrestrial Source and Sink Strengths for Atmospheric Carbon Dioxide in an Agricultural Region (Second Annual Report). Nebraska Univ., Lincoln, Dept. of Horticulture and Forestry, National Oceanic and Atmospheric Administration Environmental Data Service Contract 2-35385, Nebraska Agricultural Experiment Station Proj. 20-31, Regional Research Proj. 11-33, 24p., April 30, 1974. 14 refs.*

NTIS: COM-74-11304

Atmospheric carbon dioxide concentration and gradients and wind speed and air temperature profiles were measured from 0.5 to 16 m above the ground at Mead, Nebraska. Initial observations indicated that under stable stratified conditions, the atmospheric CO2 concentration and its vertical profiles are closely related to the concurrent Richardson number. There may be a possible application of CO2-micrometeorology to studies of atmospheric pollution and turbulent transport. (Author abstract)

48088 **APTIC NO. 69825**

Rosinski, Jan

ROLE OF AEROSOL PARTICLES IN FORMATION OF PRECIPITATION. *Rev. Geophys. Space Physics, 12(1):129-134, Feb. 1974. 29 refs.*

Variable concentrations of different-sized water-insoluble particles were found in single raindrops, bulk precipitation water, single snowflakes, and hailstones collected in different parts of the world. Aerosol particles are of extreme importance in the formation of the liquid and solid phases of precipitation. A fraction of particles in the 0.2 to 2-micron diameter size range acts as cloud condensation nuclei. Condensation of water vapor creates an aerosol cloud of particles larger than the aerosols in the surrounding air. Very large particles create conditions for aerodynamic capture of different-sized cloud particles with subsequent growth of precipitation elements. These particles are sea salts, ice in storms, and soil particles in hailstorms. The ice phase in clouds in initiated on ice-forming nuclei derived from the aerosol population. The mechanisms of ice formation in clouds are discussed. Ice-forming nuclei in snow crystals vary from 0.1 to 13 micron. The majority of particles present in snow crystals are scavenged. Soil particles from arid regions play an important role as ice-forming nuclei during the northwest monsoon season in Japan. The majority of particles in cirrus clouds are of terrestrial origin, but extraterrestrial particles have been found. Preferential transfer of magnetic particles from air into the ice phase of clouds is evident. The heat and water vapor exchange during phase transitions affect the aerosols present between cloud particles. Thermophoresis and diffusiophoresis are both active in the transfer of 0.02-2.0 micron diameter aerosol particles into precipitation elements. Particles smaller than 0.02 micron are transferred by Brownian diffusion and those larger than 2 micron by impaction. Determination of the lifetime of an aerosol particle within a cloud depends on the sizes of interacting particles and their physical state at the time of interaction. (Author abstract modified)

48089 **APTIC NO. 69237**

Sakuraba, Shinichi

AIR DISPERSION OF BAD ODOR SUBSTANCES. *(Akushu busshitsu no taiki kakusan). Text in Japanese. Preprint, Bad Odor Pollution Study Group (Japan), p. 1-13, 1974. (Presented at the Bad Odor Pollution Control Seminar, 2nd, Tokyo, Japan, July 23-24, 1974.)*

Diffusion of pollutants including odor substances depends on meteorological conditions and land shape. The concentration of a pollutant (or odor substance) is determined by wind velocity, stack height, total emission, and the standard deviation of concentration in horizontal and vertical directions. The conditions for using the normal type diffusion are particle size smaller than 10 micron, no conversion of pollutant due to photochemical effect, no material exchange below and above ground level, the same wind direction and wind velocity at different heights, and no variation of total emission. The concentration decreases with increasing sampling time since the standard deviation in horizontal direction increases. It is suggested that the relative concentration is reduced to 0.61 and 0.36 after 1 hr and 24 hr of sampling, with the concentration of 3-minute sampling as 1. Diffusion parameters for odors obtained from experiments are usually by 5-minute sampling, thus the concentration is a 5-minute average, which is about 1.43 times that of the 30-minute average. The two parameters for diffusion decrease as the wind velocity increases, but increase with increasing sampling time and increasing complexity of land shape.

48090 **APTIC NO. 68674**

Sano, Isamu, Akie Tsuruizumi, Hiroshi Ohta, and Kimihiko Ohya

STUDIES OF MALODORS -- ORGANOLEPTIC DETERMINATION OF THE ODOR INTENSITY DISTRIBUTION AROUND A KRAFT PULP MILL (II). *(Shuki chosa no ichirei -- kyodo bunpu no kettei to sono kosatsu (Dai-2-ho)). Text in Japanese. Aicho Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol., no. 9:219-226, March 1974.*

The malodor in the vicinity of the Ohji Kraft Pulp Mill has been investigated for several years. On March 15 and 26 1973, the the odor intensity distribution was measured by the organoleptic method. The simultaneous measurement of mercaptan and hydrogen sulfide concentrations was also attempted but failed due to low concentrations. The data obtained were analyzed in relation to meteorological factors (wind direction, wind velocity, clear or cloudy). At low wind velocity (less than 3 m/s), the malodor was detected in a fan-shaped area to the leeward side of the mill, while the area affected at higher wind velocity (6-7 m/s) was a rectangular shape of 0.5 km by several km. In the case of odor source at ground level such as the case of stack smoke at low wind velocity, the odor intensity to the leeward side decreased in inverse proportion to the square distance from the odor source. In the case of measuring odor intensity (I) by the five point scale method, the relationship between (I) and odor concentration (C) is given by the following equation, I equals 1.7 ln C + alpha equals 3.9 log C + alpha (alpha constant).

48091 **APTIC NO. 69433**

Saunders, R. A., J. R. Griffith, and F. E. Saalfeld

IDENTIFICATION OF SOME ORGANIC SMOG COMPONENTS BASED ON RAIN WATER ANALYSIS. *Biomed. Mass. Spectr., vol. 1:192-194, 1974. 11 refs.*

Rain water sampled in Washington, D. C. was analyzed following a sustained photooxidant smog alert which was accompanied by haze and low visibility. The analysis was effected by purging the organic content from the water with helium gas and identifying the constituents by gas chromatography-mass spectrometry. The predominant compound was 3-methylfuran, a possible intermediate or end product of the atmospheric decomposition of terpenoid hydrocarbons. The smog may therefore have resulted from the air oxidation of hydrocarbons evolved from Appalachian forestation rather than from man-associated activities. (Author abstract)

48092 **APTIC NO. 65234**

Segal, Howard M.

REAL WORLD MIXING DEPTHS FOR ABOVE-GROUND AIRCRAFT EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-92.)*

The problem of accounting for above-ground aircraft emissions is considered. Daily inversion height data are used to determine a realistic vertical containment altitude for aircraft emissions. Problems in obtaining good inversion data are described. Morning inversions are generally lower in the winter than in the summer; however, there is a greater tendency for the inversion to lift during the winter afternoons. Experimental (actual) and theoretical (box model) values of inversion base height are quite close together at critical times, such as when pollution values exceed the California State Standard. Chargeable aircraft above-ground emissions at Los Angeles International Airport based upon emissions up to 914 m were adjusted to reflect emissions to the base of the inversion on the days when the California Ambient Air Standard was violated. Aircraft emissions at the airport are adjusted to reflect real world inversion conditions on those days when the inversion height is low enough to significantly influence air pollution levels. Recommendations are made for additional research leading to possible changes of nitrogen oxides emission control requirements.

48093 **APTIC NO. 69409**

Sehmel, G. A. and F. D. Lloyd

RESUSPENSION OF TRACER PARTICLES BY WIND. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 201-203, April 1974.*

NTIS: BNWL-1850 PT3

A particle resuspension rate of 1.2 times 10 to the -10th power fraction/sec removed by wind stresses was determined for a submicrometer inert molybdenum tracer deposited on a sandy soil surface. The Mo tracer distribution on airborne soil is similar to fissile particle distribution on airborne soils at Rocky Flats. The g Mo/g airborne soil ratio is tabulated as a function of impactor stage 50% cut-off diameter and sampling elevation. The largest tracer concentration on the airborne soil was at the lowest sampling height. At higher elevation an increasingly greater portion of the airborne soil comes from outside the tracer source area. (Author abstract modified)

48094 **APTIC NO. 69410**

Sehmel, G. A. and F. D. Lloyd

RESUSPENSION BY WIND AT ROCKY FLATS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 204-211, April 1974.*

NTIS: BNWL-1850 PT3

The vertical airborne plutonium and soil concentrations and particle size distributions were determined at three sampling sites in Rocky Flats. The measurements were related to meteorological conditions and surface contamination. Airborne concentrations of fissile material ranged from 1 to 1601 particles/cu m. As wind speed increased, the concentration increased from 5 to 59.5 particles/cu m for wind speeds from 4.1 to 6.3 m/sec and to 1601 particles/cu m for wind speeds greater than 6.3 m/sec. Airborne concentrations of respirable soil particles increased proportionately with the wind speed to the 4th to 6th power. (Author abstract modified)

48095 **APTIC NO. 69587**

Sehmel, G. A., W. H. Hodgson, and S. L. Sutter

DRY DEPOSITION OF PARTICLES. In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 157-162, April 1974.

NTIS: BNWL-1850 PT3

Wind tunnel deposition velocities were calculated for monodispersed particles deposited onto surfaces of crushed gravel and sieved railroad rock. Minimum deposition velocities occurred at a particle diameter from 0.1 to 0.5 micron even when the surface roughness was increased. Deposition velocities were greater for larger gravel and significantly increased for increases in surface roughness. Particle re-entrainment occurred for particles greater than 9 micron when 0.47-1.6 cm gravel was used (friction velocity 22 cm/sec). Net deposition velocities for 28 micron particles were less than for 9 micron particles. Water evaporation decreased the deposition velocity for three combinations of particle diameter and friction velocity investigated. Approximately 20% of the deposited particles for larger gravels (3.8-5.1 cm) were found below the top layer (5 cm depth) of the gravel, suggesting that particle deposition may be enhanced in thick, coarse beds.

48096 **APTIC NO. 69589**

Sehmel, G. A. and S. L. Sutter

PARTICLE DEPOSITION RATES ON A WATER SURFACE AS A FUNCTION OF PARTICLE DIAMETER AND AIR VELOCITY. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 171-174, April 1974.*

NTIS: BNWL-1850 PT3

Deposition rates of airborne monodispersed uranine particles onto a water surface were determined in a wind tunnel. Average air velocities over water were 2.2, 7.2, and 13.8 m/sec; and particle diameters were from 0.3 to 28 micron. Deposition rates increased with both particle diameter and wind speed for particles greater than 1 micron. Deposition velocity dependency on wind speed was not established for particle diameters below about 1 micron; for such particles phoretic forces were comparable to transport forces from eddy diffusion and Brownian diffusion. The minimum deposition velocity over the water surface was 0.001 cm/sec. The maximum deposition velocity was 37 cm/sec (for 28 micron diameter particles), the largest ever reported for any surface. Since the particles used were uranine (sodium salt of fluorescein) which is hygroscopic, the possibility exists that particle sizes may have been enhanced by sorbed moisture just before final deposition into the water. Future research should consider using the ammonium salt of fluorescein which has a very low water solubility.

48097 **APTIC NO. 67929**

Senshu, Toshio and Sho Nishinomiya

A MODEL OF LOWER ATMOSPHERE AND THE CLASSIFICATION OF WEATHER CHART. *(Entotsu kara no haien kakusan kanri - kaso taiki no moderuka to tenkizu bunrui). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 73098: 1-24, May 1974. 3 refs.*

Classification of meteorological parameters was studied in an effort to predict the atmospheric pollution in an industrial area along the seashore. An objective weather chart classification was made by utilizing such meteorological factors as pressure and precipitation as recorded at several locations around the industrial area. A boundary layer model of smoke dispersion was developed which contained parameters describing the height of the inversion layer, the mixing depth, and the height and strength of the maximum land and sea breezes. Relationships between surface maximum concentrations of sulfur dioxide and weather chart classification were also studied.

48098 **APTIC NO. 65216**

Skipka, Kenneth J. and Theodore T. Frankenberg

SO2 CONCENTRATIONS DURING AIR STAGNATION EPISODES IN THE OHIO VALLEY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-68.)*

The ground level SO2 concentrations and meteorological data obtained during air stagnation episodes in the greater Ohio River Valley are examined. The episodes studied were defined on the basis of air stagnation advisories issued by National Weather Service Forecast offices during a 3-year period beginning in 1970. A continuous set of SO2 data compiled by the American Electric Power Service Corporation at 20 monitoring stations positioned to reflect the contributions from four major power facilities show that excessive ground level concentrations of SO2 were rarely coincident with air stagnation episodes. There is little evidence in these networks that there is a gradual increase in the level of SO2 as an episode progresses. An analysis of high short-term concentrations which were recorded during some of the episodes is also presented. Releases of SO2 from tall stacks during these air stagnation conditions did not contribute significantly to the ground level concentrations. Low-level sources did cause considerable increases in SO2 over short periods at specific locations. The meteorological processes which were operative during the air stagnation conditions and their interrelationship with power generation and ground level concentrations are discussed.

48099 **APTIC NO. 69414**

Slinn, W. G. N.

A SIMPLE MODEL FOR BUOYANT PLUMES BASED ON THE CONSERVATION LAWS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 240-254, April 1974.*

NTIS: BNWL-1850 PT3

Equations for the steady-state rise of a buoyant plume were derived directly from the conservation laws for mass, momentum, and energy. Top-hat profiles are used, and it was assumed that there is no horizontal pressure gradient across the plume s boundary. There were four unspecified quantities in the equations: the drag and heat transfer coefficients, the entrainment velocity, and heat production. Results are shown for the (isentropic) case when all these quantities are zero as well as for cases with various combinations of these quantities different from zero and using simple relaxation models. Insight is gained into their separate effects on the plume s properties. Results of a simple model to account for a mean wind are also demonstrated. (Author abstract modified)

48100 **APTIC NO. 69582**

Slinn, W. G. N.

A POSTULATED ESTIMATE OF WET VERSUS DRY DEPOSITION DOWNWIND OF A POINT SOURCE OF POLLUTION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific*

Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 121-132, April 1974.

NTIS: BNWL-1850 PT3

A mathematical method for estimating the relative magnitudes of wet and dry deposition downwind of a point source of pollution is presented based on Chamberlain's estimate of the dry deposition velocity. The dry deposition flux is obtained in an extension of Chamberlain's use of Reynolds analogy by multiplying the deposition velocity by a particle-size-dependent collection efficiency. The particle size dependencies of the wet and dry collection efficiencies are assumed to be the same to obtain the ratio of wet to dry fluxes. The ratio of wet to dry deposition is independent of the characteristics of the pollution. Comparisons of the theoretical results with available experimental data indicate that the theory permits a reasonable interpretation of the data, though more data is needed before firm conclusions can be drawn. (Author abstract modified)

48101 **APTIC NO. 69584**

Slinn, W. G. N.

AN EXTENSION OF THE ANALYSIS OF PLUME WASHDOWN TO INCLUDE DIFFUSION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 138-140, April 1974.*

NTIS: BNWL-1850 PT3

A mathematical expression for the analysis of plume washdown caused by reversible washout of gases is extended to include the case where diffusion is not negligible but can still be described with constant diffusivities. The results show that in the mean the plume falls at a washdown velocity equal to the rainfall rate times the dimensionless Henry's law constant for the gas and that diffusion is slightly enhanced. The decrease of the air concentration caused by previous washout is neglected, though this is customary practice in washout theory since it leads to conservative estimates in dose calculations. (Author abstract modified)

48102 **APTIC NO. 70107**

Smil, V. and D. Milton

CARBON DIOXIDE--ALTERNATIVE FUTURES. *Atmos. Environ., vol. 8:1213-1223, Dec. 1974. 25 refs.*

The computer language DYNAMO II was used in the simulation of the dynamics of the biospheric carbon. Special attention was paid to anthropogenic emissions which are critical in evaluating future atmospheric concentrations. Two extreme situations and a highly probable model indicated a rather broad span of possible future carbon levels. Depending upon energy consumption and the behavior of natural systems, atmospheric carbon dioxide concentrations may increase only marginally (to 3599 ppm) by 2020, or may more than double. The predictions of atmospheric carbon dioxide alone are insufficient to evaluate future global temperature changes. Other variables such as particulate matter, atmospheric humidity, and average cloudiness are also critical in explaining temperature fluctuations. Dynamic simulation offers a framework to which may be added a variety of hypothetical inputs to predict future concentrations of CO2 and future temperature changes. (Author abstract modified)

48103 **APTIC NO. 65180**

Spiegler, David B., Elliot Newman, and Robert E. Bailey

AMBIENT POLLUTANT CONCENTRATIONS AROUND POWER PLANTS AS A FUNCTION OF METEOROLOGICAL CONDITIONS. *Preprint, Air Pollution Control Assoc., 18p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-7.)*

Sulfur dioxide, nitrogen oxides, and total suspended particulates were measured by real-time Air Monitoring Analysis and Prediction (AIRMAP) systems near power plants along the North Shore of eastern Massachusetts and in the Hudson River Valley in N. Y. Two meteorological towers in the Hudson River Valley measured wind direction, wind speed, temperature, and temperature difference. Pollutant concentrations were influenced by the meteorological conditions and the large scale atmospheric conditions which can be predicted a day in advance. Therefore, it would be technically feasible to develop reliable air quality predictions which could be used as the basis for an intermittent fuel control strategy in the power plants. Hourly average concentrations varied in some cases by more than two orders of magnitude, depending upon atmospheric conditions. The highest SO2 conditions occurred in the winter when high pressure systems moved to the southwest resulting in southwest winds and a stable atmosphere over the region, when a polar anticyclone was over the region, and when unstable and neutral conditions with gusty winds averaging greater than 10 mph occurred. Stable atmospheres were associated with higher than average NOx readings, while strong winds were associated with lower NOx readings. Diurnal NOx variations correlated with traffic.

48104 **APTIC NO. 69656**

Susko, Michael, C. Kelly Hill, and John W. Kaufman

DOWNWIND HAZARD CALCULATIONS FOR SPACE SHUTTLE LAUNCHES AT KENNEDY SPACE CENTER AND VANDENBERG AIR FORCE BASE. *Marshall (George C.) Space Flight Center, Marshall Space Flight Center, Ala., Space Sciences Lab., National Aeronautics and Space Administration TM X-3162, M 126, 67p., Dec. 1974. 26 refs.*

The NASA/MSCF Multilayer Diffusion Model is used to predict the dispersion from the rocket motors of the Space Shuttle at Kennedy Space Center (KSC) and Vandenberg Air Force Base (VAFB). The analysis of the dispersion of the rocket exhaust effluents (hydrogen chloride, carbon monoxide, aluminum oxide) is for the nine meterorological regimes at KSC and six at VAFB. If from 10 km outside the KSC and VAFB industrial areas a 10 min short term public limit of 4 ppm HCl is applied, in none of the typical selected meteorolgical cases studied was the 10-minute limit exceeded. Meteorological conditions exist at both launch sites that constrain the shuttle launches. In one case at KSC, there was a 5 ppm average concentration for a 10-minute period at 2 km, and 1.9 ppm at 10 km distance from the launch pad. (Author summary modified)

48105 **APTIC NO. 69264**

Takeuchi, Ushio

HEAVY METALS IN PRECIPITATION. *(Kosuichu ni jukinzoku ni tsuite). Text in Japanese. Preprint, Geochemical Society of Japan, Tokyo, p. 72-73, 1974. (Presented at Geochemical Society Japan Study Meeting, Tokyo, Japan, Oct. 1-3, 1974, Paper A22.)*

Forty-two samples of precipitation, taken from January to November 1973, were analyzed for zinc, manganese, lead, copper, and iron ion concentrations by means of atomic absorption photometric analysis. An attempt was made to correlate the miotion of the nuclei of precipitation in the upper air and the terrestrial wind direction at the time of precipitation with the ion concentrations. Five directions of motion for the nuclei of precipitation were established. It was inferred from the results that industrial sources produced Mn(+2), Zn(+2), and Pb(+2) ions, but urban activities were the source of Mn(+2), Zn(+2), Fe(+2), Pb(+2) ions.

48106 **APTIC NO. 69512**

Tkachenko, A. V. and V. T. Kolezhuk

PRINCIPLES OF EXPANSION OF AN AEROSOL STREAM IN A TURBULENT FLOW. *Tr. Ukr. Nauch.-Issled. Gidrometeorol. Inst., no. 99:3-10, 1971. 10 refs.*

Translated from Russian. Air Force Systems Command, Wright-Patterson AFB, Ohio, Translation Div., FTD-HC-23-1563-74, 14p., June 20, 1974.

NTIS, DDC: AD 782530

An attempt is made to determine the possibility of interpreting experimental data on expansion of an aerosol stream from a stationary source on the basis of turbulent diffusion in the atmosphere. It leads to a rather complete explanation of the experimental principles of relative diffusion from an instantaneous source. By using a model of relative diffusion which leads to a formula, the experimental data on expansion of both clouds of an admixture from an instantaneous source and of an aerosol stream from a continuous source can be interpreted. Sutton s empirical formula is applicable only to continuous sources.

48107 **APTIC NO. 70106**

Twomey, S.

POLLUTION AND THE PLANETARY ALBEDO. *Atmos. Environ., 8(12): 1251-1256, Dec. 1974. 11 refs.*

The addition of cloud nuclei by pollution can lead to an increase in the solar radiation reflected by clouds. The reflection of solar energy by clouds already may have been increased by the addition of man-made cloud nuclei. The albedo of a cloud is proportional to optical thickness for thin clouds, but changes more slowly with increasing thickness. The optical thickness is increased when the number of cloud nuclei is increased. Although the changes are small, the long-term effect on climate can be profound. (Author abstract)

48108 **APTIC NO. 69572**

Wendell, L. L. and W. F. Sandusky

MESOSCALE TRANSPORT AND DIFFUSION STUDIES. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 68-71, April 1974.*

NTIS: BNWL-1850 PT3

Investigations of the validity of using single-point wind measurements in mesoscale radiological assessments during transport and diffusion studies are described. Field experiments were conducted in which 12 constant-volume balloons were released and tracked by double theodolites. The balloon trajectories were compared with trajectories constructed for hypothetical particles released at the same time and location and carried by the winds derived from those measured at tower locations. The average separation between balloons and corresponding particles was 1.2 mi at a travel distance of 5 mi. The longest balloon track was 10 mi, and the separation from the hypothetical particle at this distance was 0.5 mi. The appropriateness of the use of constant-volume balloon trajectories as an indication of mesoscale transport was tested by aircraft sampling of sulfur hexafluoride plume in the vicinity of the balloons along their trajectories. One test run was completed successfully. The balloon was tracked for about 30 mi with positive indications of SF6 along the whole track.

48109 **APTIC NO. 67034**

Winges, K. D., E. A. Grens, II., and T. Vermeulen

DISPERSION OF GASEOUS EMISSIONS FROM A GROUND-LEVEL LINE SOURCE. *In: Nuclear Chemistry Annual Report 1973. California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission Contract W-7405-eng-48. Rept. TID4500-R61, UC-4 Chemistry, p. 406-407, May 1974. 3 refs.*

NTIS: LBL-2366

The dispersion of gaseous emissions from a ground-level line source are considered in relation to the analysis of freeway configurations of vehicular pollutants. Three elementary cases are considered: parallel flow over a uniform plane, flow over a discontinuity in surface roughness, and flow over a perpendicular barrier attached to uniform plane. Concentration profiles are computed in each case for the region downwind from a ground-level emission source. The calculations demonstrate the feasibility of predicting concentration profiles by the continuity method, in configurations for which the velocity and pressure profiles are known or predictable. Plotted data showing input velocities and output diffusivities are presented to illustrate the approach for the barrier-flow case.

48110 **APTIC NO. 69281**

Yanagimoto, Sanji

PHOTOCHEMICAL SMOGS IN KYOTO AND THE VICINITY. *(Kyoto-shi oyobi sono shuhen ni okeru kokagaku sumoggu ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):61, Feb. 1974.*

The number of days with about 0.1 ppm of oxidant in Hyogo Prefecture was 13 between June and Sept. 1972, eight in Osaka Prefecture, and five in Kyoto Prefecture. For the same period in 1973 the numbers were 33 days in Hyogo, 61 days in Osaka, and 44 days in Kyoto. Kyoto has had no smog victims, but generally the danger of heavy smog and health damages is twice as great in a basin with topography such as Kyoto. Close monitoring is required. The time of maximum oxidant level depends on the monitoring locations but it is usually between noon and 2 pm. The time could be as early as 10 am or as late as 5 pm in some outskirts of Kyoto. The wind on the majority of high oxidant days is south to south- southwest at 5 m/sec or less. Usually the temperature is high. But in the cases of Aug. 24 and Sept. 18, 1973, the temperature was much lower than usual, and yet the oxidant level was more than 0.13 ppm. The common factors in all these occasions were the weak southerly wind, less than 10 km visibility, and more than 135 cal/cu cm of sunshine for 3 hr in the morning. On these days, an inversion or an isothermal layer existed in the altitude of 300 to 2000 m at 9 am. On four occasions in 1971 and on nine occasions in 1972, there was another inversion or isothermal layer in the upper stratum of 3000 m. The temperature difference between the ground and Mount Hiei is an index for the atmospheric stability and oxidant concentration. When the temperature difference was within 3.5 C, the oxidant concentration was about 0.06 ppm; and when more than 3.5 C, the oxidant level was often greater than 0.06 ppm.

48111 **APTIC NO. 70229**

Yanagimoto, Sanji and Kenjiro Onishi

PHOTOCHEMICAL SMOGS IN KYOTO AND THE VICINITY. *(Kyoto-shi oyobi sono shuhen ni okeru kokagaku sumoggu). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:72-74, Feb. 1974.*

Oxidant concentrations were measured at 17 monitoring stations from 1971 to 1973. Only 5 days in June to September in 1971 had an oxidant concentrations exceeding 0.10 ppm; these days increased to 44 days in 1972 and 48 days in 1973 in the same period of time. Stream line analysis of the sea land wind from data collected from 54 days which showed oxidant concentrations of higher than 0.10 ppm, during the period of June-October of 1972, showed that 45% of the days had south-southwest wind, 24% unstable wind, 14% northeast wind, 11% west-northwest wind, and 7% southeast wind. The highest oxidant concentrations mostly occurred between 12:00 am and 4:00 pm. Days with concentrations higher than 0.13 ppm were mostly preceded by concentration of less than 0.05 ppm for 2 days in advance. In 1972, 62 injuries were reported. The injuries increased to 599 in 1973, including 546 elementary and junior high school students injured on a single day. The high oxidant concentration was also controlled by the direction of wind at up to a height of 1000 m.

48112 **APTIC NO. 69578**

Young, J. A., T. M. Tanner, C. W. Thomas, N. A. Wogman, and M. R. Petersen

CONCENTRATIONS AND RATES OF REMOVAL OF CONTAMINANTS FROM THE ATMOSPHERE IN AND DOWNWIND OF ST. LOUIS. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 102-105, April 1974.*

NTIS: BNWL-1850 PT3

Atmospheric concentrations of trace elements, sulfates, sulfur dioxide, carbon monoxide and freons were measured upwind, downwind, and over the city of St. Louis during July 1973 to determine the rates at which the concentrations are decreased downwind by atmospheric mixing processes, dry deposition, and chemical reactions. Concentrations of lead, bromine, and SO2 in downtown St. Louis averaged 20 times higher than the upwind concentrations; freon concentrations were also considerably higher in the downtown area. Lead, bromine, and freon-11 concentrations at a 20-mile sampling arc downwind of the city averaged only 20, 13, and 60%, respectively, of their downtown concentrations, whereas SO2 concentrations at the 20-mile arc were higher, presumably because of the presence of large SO2 sources along the Mississippi, east of St. Louis. The large decreases in lead, bromine, and freon concentrations between downtown and the 20-mile arc probably resulted from vertical mixing through the boundary layer. The concentrations of these compounds decreased slowly, however, with distances beyond the 20-mile arc, with lead and bromine concentrations averaging 68 74%, respectively, at 60-80 mi downwind. Calculated freon concentration at the outer arc (60-80 mi) became 90% of the average concentration at the 20-mile arc, suggesting that atmospheric mixing processes decreased the contaminant concentrations around 10% and that dry deposition processes removed around 20% of the lead and bromine between the 20-mile arc and the outer arc. Sulfur dioxide concentrations decreased to 27% of the 20-mile arc concentrations at the outer arc, suggesting sulfation in addition to mixing and deposition processes.

48113 **APTIC NO. 69934**

Zakharov, V. M., O. K. Kostko, and V. S. Portasov

USE OF LASER SOUNDING TO DETERMINE CERTAIN ATMOSPHERIC CHARACTERISTICS. *(Primeneniye lazernoy lokatsii opredeleniya nakotorykh kharakteristik atmosfery). Meteorol. i Gidrol., no. 4:80-85, April 1974. 4 refs. Translated from Russian by Michael Pond, Techtran Corp., Glen Burnie, Md., NASA-TT-F-15,692, 11p., June 1974.*

NTIS: N74-26879

Experimental results of atmospheric sounding by a laser locator at the wavelengths of 694.3 and 1060 nm are presented. Total reverse dispersion profiles were obtained; the sounding data at nacreous cloud altitude compared favorably with other lidar measurements. Data was processed from dual-frequency sounding for signal distribution and was determined by reverse molecular and aerosol dispersion. Atmospheric density was computed by reverse molecular dispersion.

48114 **APTIC NO. 69830**

Atomic Energy Commission, Div. of Biomedical and Environmental Research and Environmental Protection Agency, Div. of Meteorology

CHEMIST-METEOROLOGIST WORKSHOP-1974. JANUARY 14-18, 1974. FT. LAUDERDALE, FLORIDA. *66p., 1974. 6 refs.*

NTIS: WASH 1217-74, UC-4, UC-20; GPO

The results of a Chemist-Meteorologist Workship are presented. The first panel discussed technology and environmental impact. The increased demand for energy has led to increased use of coal, which in turn has led to increased pollution. Atmospheric transport and transformation, health and ecological effects, and control methods are presented for these emissions. The accelerated introduction of nuclear power to alleviate the energy crisis is also reviewed. The use of alternative domestic oil and gas sources, an assessment of environmental costs of energy systems, and recommendations for information systems, the total ecosystem perspective, the regional scale, and public information, are also discussed. The second panel discussed precipitation chemistry. The modeling of precipitation chemistry and associated processes in the atmosphere, precipitation chemistry and terrestrial response, trace metals in rainwater and in lakes, and field-sampling network design and analysis techniques are discussed. The third panel discussed atmospheric aerosols and transport. The need for measurements of fine aerosols, instrumentation for measuring fine particles, surface background aerosols, and meteorological data needed for monitoring site selection and pollutant data intrepretation, are discussed. The fourth panel discussed radioactivity in the atmosphere. Atmospheric nuclear detonations, nuclear power, fossil fuel power, emissions of radioactivity, and other aspects of nuclear power are discussed.

48115 **APTIC NO. 69970**

California Univ., Livermore, Lawrence Radiation Lab., National Aeronautics and Space Administration, Iowa, Ames Research Center, and Bay Area Air Pollution Control District, San Francisco, Calif.

DEVELOPMENT OF AN AIR POLLUTION MODEL FOR THE SAN FRANCISCO BAY AREA. THIRD SEMIANNUAL REPORT TO THE NATIONAL SCIENCE FOUNDATION. *NSF-Research Applied to National Needs Interagency Agreements LLL-AG-412, NASA-ARC-AG-411, and BAAPCD-GI-36390, TID-4500, UC-11, 11p., Sept. 23, 1974.*

NTIS: UCRL-51660

A semiannual report on activities related to the development of an air pollution model for the San Francisco Bay Area is presented. Activities are summarized for operational planning, stationary and mobile source inventories, photochemical kinetic models, model development and validation, and model application. Model development and validation is summarized in terms of data base utilization, a mass consistent wind field model which provides for inclusion of inversion height change due to several factors, topographic data, source data, studies of numerical errors made in the differencing approximation of an initial air pollution model, and model programming. Responsibilities are defined for each of the task groups involved in the model development program. Stationary source emission data are presently entered into the data bank, and a comprehensive mobile emission inventory should be available to the model by October 1974. Plans are complete to conduct fluorescent particle tracer experiments for investigating transport between the inversion layer and the mixing layer, with initial experiments planned for August 1974. A first set of reduced photochemical reactions is selected, and work is continuing to assess assumptions and to test the sensitivity of the reactions to various parameters.

1973

48116 **APTIC NO. 69826**

Arshinov, Y. F., V. A. Donchenko, V. Y. Zuyev, V. V. Kostin, and I. V. Samokhalov

EXPERIMENTAL STUDY OF THE ATTENUATION AND BACK-SCATTERING OF ALPHA 2.36 AND 0.63 MICRON LASER RADIATION BY ARTIFICIAL FOG AND SMOKE. *(Eksperimental noye issledovaniye oslableniya i obratnogo rasseniya izlucheniya okg s dlinami voln alpha 2.36 and alpha 0.63 isskustvennymi tumanami i dymami). Izv. Vysshikh Uchebn. Zavedenii Fiz., no. 6:62-*

67, 1973. 11 refs. Translated from Russian. Naval Intelligence Support Center, Washington, D. C., Translation Div., 10p., April 4, 1974.

NTIS, DDC: AD 782211

The attenuation and back-scattering of 2.36 and 0.63 micron laser radiation due to artificial fogs and smoke was studied experimentally. For these wavelengths, the ratio of the attenuation coefficients was a linear function alpha (2.36) equal to K times alpha (0.63), where K equalled 1.18 for fogs having the most probable microphysical parameters and 0.4 for smoke under the same conditions. The geometrical factors in the experiment and the optical properties of the scattering medium had a greater effect on the intensity of the back-scattered radiation than the wavelength of the incident radiation.

48117 **APTIC NO. 69780**

Aziz, K., J. K. Donnelly, and J. P. A. Wallis

COMPUTER SIMULATION OF POLLUTANT DISPERSION: SINGLE STACK AND AIR SHED MODELS. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, p. 31-51. 10 refs. (Nov. 1-2.)*

Analytical, Sutton, and numerical models are compared on a consistent basis for a single stack. Numerical means can accurately determine ground level concentrations for single stacks. Diffusion coefficients affect discretization error considerably, small coefficients giving large errors and large coefficients small errors. In both cases the error decreased with increased downwind distance. Turbulent transport models did not compare favorably with the Sutton equation or analytical solutions. A proposal is made to extend this work to a simple air shed model for Alberta. Various aspects of an air shed model are discussed. (Author abstract modified)

48118 **APTIC NO. 69491**

Barnard, William, Lawrence Truppi, Gregory Sharp, and Malcolm Wilkins

AN EVALUATION OF THE VARIATION OF TOTAL SUSPENDED PARTICULATES WITHIN A CHESS NEIGHBORHOOD: FAIRFIELD, ALABAMA. NOVEMBER 1-16, 1973 (AN IN-HOUSE REPORT). *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 27p., 1973. 6 refs.*

The selection of a CHESS (Community Health and Environmental Surveillance System) site and an evaluation of the total suspended particulates within the CHESS site of Fairfield, Alabama are discussed. A variety of parameters must be considered when selecting a CHESS air monitoring site. Location of the epidemiological study population, source influence, property availability, and clearance from obstructions such as buildings and trees have all be used in the past selection of CHESS sites. This study at Fairfield revealed the effects of topography. While there is a minor effect of point source bias, the geographical boundaries which exist across this sector, combined with the local meteorological conditions greatly affect the validity of short-term exposure data. Short time frames, i.e., one or two days, representative of high pollution episodes, may exhibit extreme variations in pollutant concentrations across the monitored sector. Daily values varied from 37.2 to 231.8 micrograms/cu m within the sample grid and could be contributed directly to the existence of valleys or ridges acting as pollutant boundaries. Long-term (greater than 5 days) averaged exposure data on the other hand seem to be quite consistent with the central site monitoring concept, even under the extreme geographical conditions of this study sector. Only one of the twelve grid sites failed the applied t-test. Improved accuracy of exposure estimates could be obtained if the entire study population for the specific sector lived under similar topographical conditions. Such a case would be an uncommon occurrence. Therefore, other alternatives may be applicable. Considering smaller sectors and thus smaller study populations or increasing the number of monitoring sites within a sector (dependent on topological considerations), are means by which exposure estimates could be improved. However, CHESS- CHAMP is presently an on-line system monitoring study populations in specific areas. Existing short-term air monitoring problems could be solved by means of a mobile monitoring laboratory which could measure pollutant concentrations on an hourly basis and therefore gather information in several locales during high pollution episodes. The short-term air monitoring capabilities of the CHESS-CHAMP program should be improved. (Author conclusions modified)

48119 **APTIC NO. 69529**

Bick, Hartmut and Erika F. Drews

SELF-PURIFICATION AND CILIATA PROLIFERATION IN ACID [illegible]DIUM (MODEL EXPERIMENTS). *(Selbstreinig[illegible] und Ciliatenbesiedlung in saurem Milieu (Modellvers[illegible]en)). Text in German. Hydrobiologia, 42(4):393-402, 1973. 7 refs.*

The effect of the increasing acidification of surface water bodies due to the washout of sulfur dioxide from the atmosphere by precipitation on the bacterial decomposition of peptone, and the associated ciliated Protozoa was studied in model experiments. Increasing acidification from over pH 7 to pH 3 caused reduced rate and finally complete inhibition of the decomposition and nitrification processes. No oxidation of ammonia took place at pH values below 5. The total counts of bacteria and Ciliata as well as the number of species of ciliated Protozoa decreased slowly within the pH range 7-5, and rapidly at pH values of 5-3. The pH tolerance limits of 29 Ciliata species were determined to range from pH 3.0 to pH 5.3.

48120 **APTIC NO. 69813**

Blaettner, Wolfram G. and Michael B. Wells

SCATTERING CHARACTERISTICS OF HOMOGENEOUS AND INHOMOGENEOUS PARTICLES: SCATTERING IN THE VISIBLE AND NEAR INFRARED (FINAL SCIENTIFIC REPORT). *Radiation Research Associates, Inc., Fort Worth, Tex., Air Force Contract F19628-73-0130, Proj. 7621, Task 762106, Work Unit 76210602, DoD Element 62101F, DoD Subelement 687621, Rept. AFRL-TR-74-0025, RRA-T7313-1, Suppl. 1 to Final Report (Part I), 159p., Nov. 20, 1973. 26 refs.*

NTIS, DDC: AD 778849

Data for the absorption and extinction efficiencies of both homogeneous spherical aerosol particles and inhomogeneous spherical shell aerosol particles as a function of size parameter are presented along with sample calculations from a computerized analysis of aerosol properties using Mie theory. Calculations are also presented for the effect of atmospheric humidity on the macroscopic scattering properties of aerosols for visible and near infrared light. Tropospheric, stratospheric, and fog particles are considered. The data reflect differences in the efficiency factors for homogeneous and inhomogeneous particles. Efficiency factor differences are particularly evident for aerosol particles consisting of a spherical kernel of water-insoluble material surrounded by a spherical water shell and for particles of homogeneous composition (aasuming an average index of refraction that is calculated by mixing rules). The effects inhomogeneity of the shell particles are not important for scattering angles less than about 4 degrees.

48121 **APTIC NO. 69620**

Brun, J., J. Hucon, and R. Le Quinio

THE INFLUENCE OF THE EXPOSURE TIME ON THE EVALUATION OF THE COEFFICIENTS OF ATMOSPHERIC DIFFUSION. *(Influence de la duree d exposition sur l evaluation des coefficients de diffusion atmospherique). Text in French. Preprint, Commissariat a l Energie Atomique, Paris (France), 23p., 1973. 18 refs. (Presented at the Symposium on the Physical Behavior of*

Radioactive Contaminants in the Atmosphere, Vienna, Austria, Nov. 12-16, 1973.)

NTIS: CEA-CONF-2475

The influence of the exposure time on the coefficient of atmospheric diffusion was studied by means of fluorescein sodium tracer at distances of up to 5700 m, using sampling times ranging from 15 min to 4 hr. The peak concentration measured at a given distance from the punctiform source decreased with the source distance, and also with decreasing stability of the wind direction. Prolongation of the sampling time resulted in reduced peak values at a given distance due to the higher probability of wind direction variations over a longer period of time.

48122 **APTIC NO. 67152**

Bullrich, K.

THE ATMOSPHERIC AEROSOL AND ITS SIGNIFICANCE FOR ENERGY TRANSPORT AND CLIMATIC CHANGES. *(Das atmosphaerische Aerosol und seine Beduetung fuer Energie-Transporte und Klimaenderungen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Bad Soden, Germany, 1973, p. 50-57. 15 refs. (Oct. 17-18.)*

The effect of natural and anthropogenic aerosols on the energy budget and climate is discussed. Due to their relatively long residence time of about 30 days in the troposphere, aerosol particles can be transported to remote areas in the course of atmospheric circulation. The aerosol concentration is much higher over continents than over oceans in the lower 5 km-layer of the atmosphere. The residence time of aerosols in the stratosphere is much longer than in the troposphere. While the anthropogenic aerosol accounts for only 11.5% of the total output, it is concentrated on about 2.5% of the earth s surface, which implies a possible influence of anthropogenic aerosol on the climate and energy transport processes. The reduction of the solar radiation and albedo caused by aerosol particles is counteracted by light scattering and absorption processes taking place on the same particles, which means that the temperature- reducing and temperature-increasing effects of atmospheric aerosol largely compensate each other. Consequently, the effect of aerosol, including anthropogenic ones, on the heat balance, and on climate is presently negligible, but it may assume considerable proportion in the future due to the ever-increasing energy production with its concomitant aerosol output.

48123 **APTIC NO. 69387**

Cagnetti, P. and M. Pagliari

LONG RANGE TRANSPORT AND DIFFUSION: AN APPROACH TO THE PROBLEM FROM THE HEALTH PROTECTION POINT OF VIEW. *International Radiation Protection Assoc., Proc. Int. Radiat. Prot. Assoc., Int. Congr., 3rd, Washington, D. C., 1973, p. 344-349. 8 refs. (Sept. 9-14.)*

NTIS: CONF-730907-P1

The problem of transport and diffusion of gaseous releases in the atmosphere after they travel distances from 10s to 100s of km is analyzed in order to derive an expression for the cloud-dosage at ground level. Experimental data is used to calculate a function which relates the coefficient of diffusion to the time of travel. With very conservative assumptions from the health protection point of view, the radially symmetrical equation of diffusion is solved for an instantaneous release, and the integrated concentration along the travel direction is calculated. After a travel of 100 km, the values of cloud-dosage are about 10 times lower than those obtained by extrapolation of Pasquill estimates during category F of stability. (Author abstract modified)

48124 **APTIC NO. 69306**

Carey, William M., Lewis Battist, and Warren E. Keene

MEASUREMENTS OF THE DISPERSION OF GASEOUS RADIOACTIVE EFFLUENTS FROM AN OPERATING BOILING WATER REACTOR. *International Radiation Protection Assoc., Proc. Int. Radiat. Prot. Assoc., Int. Congr. 3rd, Washington, D. C., 1973, p. 291-295. (Sept. 9-14.)*

NTIS: CONF-730907-P1

Measurements of off-site concentrations of the radioactive gaseous effluents from a boiling water reactor were correlated with measured meteorological parameters to define plume behavior at a coastal site. Average ground concentrations were in the 10 to the -9th microcurie/cu cm range, while peak values were as high as 10 to the -7th microcurie/cu cm. Sea breeze fumigation and nocturnal fanning conditions significantly affected dispersion characteristics. (Author abstract modified)

48125 **APTIC NO. 69610**

Carson, D. J. and F. B. Smith

A THERMODYNAMIC MODEL FOR THE DEVELOPMENT OF A CONVECTIVELY UNSTABLE BOUNDARY LAYER. *Preprint, International Union of Theoretical and Applied Mechanics, Brussels (Belgium) and International Union of Geodesy and Geophysics, Paris (France), 28p., 1973. 13 refs. (Presented at the Symposium on Turbulent Diffusion in Environmental Pollution, 2nd, Charlottesville, Va., April 8-14, 1973.)*

Two approaches to the simple parameterization of the development of a dry, convectively unstable boundary layer, capped by a stable layer, are discussed. In purely thermal models, the important interfacial entrainment process is assumed to be controlled, to a first approximation, only by the intensity of the thermal bombardment of the interface and is characterized by postulating that the heat flux due to entrainment is directly proportional to the surface sensible eddy heat flux. A model which gives the parameterization of a combined dynamic and thermal basis is also formulated since entrainment is essentially a dynamic process. The entrainment process is proposed to be a function not only of the surface heat flux, as in the first approach, but also of the changes in wind velocity and potential temperature which are observed at the immediate top of a developing convectively unstable boundary layer. Numerical integration enables the evolution to be described in terms of two constants which await observational determination. (Author summary modified)

48126 **APTIC NO. 69933**

Clark, B. A. J.

THE EFFECT OF ATMOSPHERIC AEROSOLS ON THE APPARENT COLOURS OF SIGNAL LIGHTS--A LITERATURE SURVEY. *Australian Defence Scientific Service, Melbourne, Aeronautical Research Labs., ARL Systems Note 37, 10p., Oct. 1973. 14 refs.*

NTIS: N74-25894

In fogs or dust storms where the airborne particles responsible for light scattering are larger than about 2 micron or where the particles are smaller than this but are varied in size, the scattering is practically independent of wavelength. If the particles are smaller and relatively uniform in size, wavelength- selective scattering of light can occur. This condition occurs with industrial haze, natural haze, smoke, and sometimes with fogs and as a consequence of dust storms. A literature survey indicated few attempts to assess the importance of selective scattering as an unwanted and possibly hazardous effect on the apparent colors of signal lights used in transport systems. A suggestion is made for data collection relevant to the possible hazard in aviation. (Author summary)

48127 **APTIC NO. 69470**

Closs, R. L. and A. D. Surridge

THE TEMPERATURE PROFILE IN THE LOWER ATMOSPHERE OBTAINED BY ACOUSTIC SOUNDING. *Preprint, Otago Univ., Dunedin (New Zealand), Physics Dept., 3p., 1973. 5 refs.*

A method of obtaining phase-height records from which temperature profiles of the lower atmosphere (up to heights of 200 m) can be calculated is described. An interrogating pulse of sound with a duration of about 20 milliseconds and a frequency of 1 kiloHertz is transmitted vertically from an array of loudspeakers. The sound energy scattered back to the ground is received by a directional microphone. The electrical output from the microphone is passed to a lock-in amplifier so that the component of the scattered signal which is in phase with a reference oscillator is measured. The output from the lock-in amplifier is recorded on magnetic tape for future analysis. The theory on which the method is based is similar to that for the visibility of Young s double slit interference fringes. It predicts that maxima will be observed in the output of the detector when the integrated phase path multiplied by the temperature difference is an even multiple of pi radians. When the temperature profile is changing with time, the separation between maxima and minima increase or decrease. The pattern of maxima and minima when an inversion is forming or breaking up is that of a herring-bone structure.

48128 **APTIC NO. 69398**

Cobb, William E.

ATMOSPHERIC ELECTRICAL CONDUCTIVITY AND THE DETECTION OF GLOBAL AEROSOL POLLUTION. *Preprint, 10p., 1973. (Presented at the Technical Conference on Observation and Measurements of Atmospheric Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

The relationship between atmospheric conductivity and ion concentration is conductivity equals small ion density times the small ion mobility times the elementary charge per ion. The change of small ion density caused by pollution can thus affect conductivity. In a study of the relationship between conductivity and condensation nuclei density at the Mauna Loa high altitude observatory in Hawaii, the sensitivity of the conductivity to changes in the nuclei density was clearly evident and this sensitivity increased as the air became cleaner. The conductivity measurement method devised by Gerdien has been used for many years. The conductivity, used to establish an index related to suspended particulates, is usually monitored at sites remote from sources of aerosol pollution. Electric properties of oceanic air have been measured for 70 years due to the foresight of the Carnegie Institution of Washington. Recent conductivity measurements have been made in oceanic and polar regions. Stratospheric aerosol measurements have also been taken. Atmospheric conductivity can provide a somehwat unique and sensitive way of documenting aerosol conditions, particularly with respect to long-term trends in the level of suspended particulates.

48129 **APTIC NO. 69824**

Davitaya, F. F.

DYNAMICS OF THE GAS COMPOSITION OF THE EARTH S ATMOSPHERE. *Bonner Meteorol. Abhandl., no. 17:513-522, 1973. 13 refs.*

NTIS: N74-27092

The gas composition of the earth s atmosphere has not been invariable during the geologic history. Values of the organic production of atmospheric oxygen are presented for the geologic epochs back to 500 million years. According to these and other estimates, the density and composition of the atmosphere changed considerably until a dynamic equilibrium was reached, probably in the Triassic period. Since at least 200 million years, the total amount of free atmospheric oxygen has been stationary. The anthropogenic increase in atmospheric carbon dioxide content, however, must irrecoverably change the oxygen concentration. Estimates for the expenditure of O2 and production of CO2 due to combustion are presented and discussed. Today, the world combustion of fuel produces annually 14 times 10 to the 9th power tons of CO2 and consumes 13 times 10 to the 9th power tons of atmospheric oxygen. These figures increase each year by 5-10%. With an annual increase of 10%, the bulk of the 1.5 times 10 to the 15th tons of atmospheric oxygen will be exhausted within the next 100 years, provided the presently prospected resources of fuel may increase by several orders of magnitude which does not seem impossible. New forms of energy must be sought; the direct use of solar radiation seems to be the most promising new form. (Author abstract)

48130 **APTIC NO. 67059**

Driscoll, J. N. and J. F. McCoy

APPLICATIONS OF ION SELECTIVE ELECTRODES TO THE MEASUREMENT OF NITRATE AEROSOL CONCENTRATIONS IN THE ATMOSPHERE. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):36-39, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Laboratory studies on the application of ion selective electrodes to the measurement of nitrate aerosol concentrations in the atmosphere are reviewed. Three different electrodes are being evaluated for the determination of dissolved nitrate. The first involves direct measurement of nitrate with a liquid ion exchange nitrate electrode. Halide interference with the electrode is eliminated by adding silver ion to the sample prior to measurement. The other two electrodes involve measurement of nitrate after reduction to nitrite or ammonia. The nitrite and ammonia electrodes represent a series of newly developed chemical sensing electrodes in which a hydrophobic gas permeable membrane is used to separate the collection solution from the internal filling solution of the electrode. The reactions of nitrite or ammonia with the internal filling solution change the pH and are sensed by pH measurement. The major advantages of the nitrite and ammonia electrodes are a tenfold increase of sensitivity over the nitrate electrode and interference free measurements.

48131 **APTIC NO. 65166**

Ebisawa, Eiji and Katsuhisa Taguchi

A SURVEY OF THE KASHIMA AREA METEOROLOGICAL OBSERVATIONS. *(Kashima chiku kisho kansoku no gaiyo). Text in Japanese. In: Ibaraki-ken Kogai Gijutsu Senta Kenkyu Hokoku. p. 107-115, July 1973.*

In an attempt to find correlations between weather and air pollution in the Kashima industrial area, the meteorological data, temperature, humidity, wind velocity, wind direction, and inversions obtained at eight weather stations during 1969 are evaluated. Average monthly temperatures and number of days with a maximum temperature above 30 C are given in diagrams. The average monthly humidity was in the range of 70-80% except during mid-summer months. A higher wind velocity was recorded in February and October. The wind velocity varied greatly from place to place; however, the average wind velocity was 2-6 m/sec. The most frequent wind direction streamlines and wind rose by month are given. The seasonal trends in wind direction are also discussed. Inversions were more prominent in January, February, November, and December and less in May, June, and September. The sulfur dioxide concentration was in the range of 0.1-0.3 mg/day/100 sq cm measured by lead peroxide candles, and settling particulates were 15 ton/sq km/mo by dust jar in some locations, which was attributed to road and building constructions in the area. The pollution data obtained were insufficient to find significant correlation between weather and air pollution.

48132 **APTIC NO. 70043**

Edgington, D. N., J. A. Robbins, and J. O. Karttunen

THE DISTRIBUTION OF 210 PB AND STABLE LEAD IN LAKE MICHIGAN SEDIMENTS. *In: Radiological and Environmental Research Division Annual Report, Ecology. January through December 1973. Argonne National Lab., Ill., p. 63-76, 1973. 13 refs.*

NTIS: ANL-8060 Part III

In previous studies, the deposition of atmospheric particulates was determined to be the most significant route for the pollution of Lake Michigan by lead and other elements. Analysis of sediment cores for lead showed there is a considerable enrichment in the concentration of this element in the superficial layer (0-3 cm), as there is for several other elements, in comparison to that found lower in the core. This superficial lead was suggested to be due to the increasing concentrations of lead now entering the lake and its being scavenged by suspended organic detrital or clay particles. It appears that there is little evidence of postdepositional mobility of lead in the sediment cores from Lake Michigan, and the observed distribution in concentration can be equated directly to changes in the input flux. The distribution of lead was measured in several cores taken in 1972 from the southern half of Lake Michigan. The cores were chosen because the profiles and porosity of lead(210) and cesium(137) had already been measured, and their sedimentation rates and mixing depths been calculated. To arrive at a quantitative prediction of lead profiles in sediment cores, an atmospheric source function was constructed based on historical data for lead emissions and usage and other sources. Thus, an emissions inventory was constructed for lead based on burning coal and gasoline, which accounts for 95% of the lead emissions, from 1830 and 1910, respectively, to the present. The agreement of estimated river and atmospheric inputs of lead with those calculated from inventory of lead in sediments was remarkable.

48133 **APTIC NO. 66941**

Ehhalt, D. H. and L. E. Heidt

VERTICAL PROFILES OF CH4 IN THE TROPOSPHERE AND STRATOSPHERE. *J. Geophys. Res., 78(24):5265-5271, Aug. 20, 1973. 16 refs.*

Vertical profiles of the methane mixing ratio in the troposphere and stratosphere were obtained by collecting air samples and analyzing their CH4 concentrations by gas chromatography. Two sets of tropospheric profiles, each covering a full year, were measured; one of the sets came from over the Pacific, 200 km offshore from Santa Barbara, California, and the other from continental surface air over Scottsbluff, Nebraska. Although some of the individual profiles showed large fluctuations with time and space, a systematic seasonal variation of tropospheric CH4 concentration was not established. Methane, on a 1 year average, showed a nearly uniform distribution in the troposphere, with an average volume mixing ratio of 1.41 ppmv. The only systematic gradient in the troposphere was observed for the Scottsbluff profiles which showed a decrease in the CH4 mixing ratio close to the ground. The stratospheric CH4 profiles, in contrast, showed a systematic decrease with altitude, with a steeper gradient directly above the tropopause. The gradient appeared to be weaker at higher altitudes. The CH4 mixing ratio at 50 km dropped at 0.25 ppmv. (Author abstract modified)

48134 **APTIC NO. 69333**

Eschelbach, G.

INFLUENCE OF HAZE ON THE RADIATION BUDGET OF THE ATMOSPHERE IN THE SOLAR SPECTRAL RANGE. *(Der Einfluss des Dunstes auf den Strahlungshaushalt der Atmosphaere im solaren Spektralbereich). Text in German. Ann. Meteorol., vol. 6 or 8:327-330, 1973. 7 refs.*

The influence of haze and aerosol particles on the energy balance of the atmosphere in the visible range of the solar spectrum was studied in model calculations, assuming spherical aerosol particles with known complex refractive index. Computational results including multiple scattering and the attenuating properties of atmospheric aerosol are presented. The introduction of aerosol results in gradual decrease in the energy loss of the Earth with increasing ground level albedo. The energy loss becomes zero at about 0.8 albedo. The introduction of haze as an absorbing aerosol implies a gain in energy for the atmosphere-ground system. The calculations indicate a considerable influence of haze on the energy balance of the Earth.

48135 **APTIC NO. 64761**

Farrow, J. B.

THE INFLUENCE OF THE ATMOSPHERE ON REMOTE SENSING MEASUREMENTS. VOLUME 1. SUMMARY REPORT. *Hawker Siddeley Dynamics Ltd., Hertfordshire (England), Space Div., European Space Research Organization Contracts 1837/72PP and 1838/72PP, Rept. HSD TP 7400, ESRO CR(P)-353, 93p., Dec. 1973. 26 refs.*

NTIS: N74-20986

Information is compiled on the basic physics of atmospheric processes which influence remote sensing measurements. These processes include: gaseous absorption and emission; particle scattering, absorption, and emission; refraction; and turbulence. The most important atmospheric variables affecting these processes are: temperature; pressure; and atmospheric composition, both gaseous and particulate. Gaseous components considered in terms of their effects on remote sensing include: the permanent gases in the atmosphere; carbon dioxide; water vapor; ozone; and pollutants, especially hydrocarbons and compounds of nitrogen and sulfur which possess distinctive infrared spectra. Particulates are also considered, both in terms of Rayleigh atmospheres (clean air) and particle emissions into the atmosphere due to human activity. Particulate addition on a local scale reduced the visibility and solar illumination, while on a global scale results in long-term climatological effects due to changes in mean solar illumination. Reference is also made to the ionosphere in terms of microwave and radiowave activities.

48136 **APTIC NO. 69914**

Ferber, G. J. and R. J. List

LONG-RANGE TRACER EXPERIMENTS. *In: Atmospheric Transport and Dispersion of Pollutants and Related Meteorological Studies, July 1971-June 1972 (Annual Progress Report). National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Lab., Atomic Energy Commission Contract AT(49-7)-4, NOAA-TM-ERL-ARL-40, NOAA-74011814, p. 47-48, March 1973.*

NTIS: COM-74-10344

The feasibility of conducting long-range atmospheric tracer experiments to study transport and diffusion of gaseous plumes over continental distances was studied. The goal was to improve understanding of plume behavior and thus enhance the ability to estimate location and strength of a source from air samples obtained at great distances. A series of experiments was conducted in which a tracer gas was released for 3 to 12 hr, and then air was sampled at ground level and aloft at different locations to determine tracer distribution as a function of time and distance. Compounds investigated as potential tracers were sulfur hexafluoride and two halocarbons (dibromotetrafluoroethane and dibromodifluoromethane). All are detectable by electron-capture gas chromatography at low concentrations. Future experiments are needed to determine these tracers at the farthest distances using an alternative experimental approach.

48137 **APTIC NO. 69335**

Fontan, Jacques and Jean Servant

TRACE GASES IN THE ATMOSPHERE. *(Les gaz en traces dans l atmosphere). Text in French. Recherche, 4(38):857-866, Oct. 1973. 12 refs.*

Studies on the generation, reactions, and elimination of trace gases in the atmosphere are reviewed. The ozone formed in the atmosphere is destroyed by photolysis as it reacts with atomic oxygen to yield molecular oxygen. In polluted air, ozone is formed in photochemical reactions liberating atomic oxygen especially from nitrogen oxides. Then, ozone reacts with the latter or other pollutants, such as olefins, to form aldehydes and free radicals. Nitric oxide, nitrogen dioxide, and hydrogen sulfide are chiefly responsible for the elimination of ozone from the atmosphere. Anthropogenic sulfur dioxide, generated by combustion processes, is eliminated from the atmosphere by precipitation or by dry deposition, partly in the form of sulfuric acid, or sulfates. Nitric oxide is rapidly transformed into NO2 by ozone, and the latter converts to nitric acid, neutralized by ammonia to form ammonium nitrate. At wavelengths around 4000 Angstrom, NO2 is dissociated to NO and O, which latter participates in ozone formation. Stratospheric aircraft, emitting nitrogen oxides, have already caused a decrease in the ozone concentration in that layer. Recent studies demonstrated the predominant role of natural processes in oceans in the formation of carbon monoxide. Hydrocarbon emissions, a result of anthropogenic factors, are essential for photochemical smog formation.

48138 **APTIC NO. 67163**

Friedlander, S. K.

RELATING PARTICULATE POLLUTION TO SOURCES: FUNDAMENTAL PRINCIPLES. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 113-116. 33 refs. (Oct. 17-18.)*

Calculations relating the pollution aerosol to its sources are presented. Atmospheric particles in the size range 0.1-1.0 micron are relatively stable away from the immediate vicinity of sources over the time scale of hours equivalent to passage through an urban basin. Coagulation takes place slowly because concentrations are usually not high, and Brownian diffusion is weak in this size range. The particles are too small to sediment rapidly. For the 0.1-1.0 micron range, the particle size distribution of the aerosol can be calculated from the distribution of the primary sources and a suitable growth law. (Author conclusions modified)

48139 **APTIC NO. 69902**

Gaut, Norman E.

COLLECTION AND ANALYSIS OF OBSERVATIONAL DATA PERTINENT TO CIAP - A PROGRESS REPORT (FIRST ANNUAL REPORT - VOL. I). *Environmental Research and Technology, Inc., Lexington, Mass., Dept. of Transportation Contract DOT-05-20317, 59p., July 1973. 19 refs.*

NTIS: PB 231957

Progress made in the collection and analysis of data related to the dynamics of the atmosphere is described. The objective of the study was the assessment of the potential impact of an operational fleet of supersonic aircraft on the earth s climate. Information on changes in the natural atmosphere over short periods of time was gathered to compute the zonal average of time-averaged zonal wind, zonal average of time-averaged meridional wind, stream function for the meridional circulation, transient eddy angular momentum transport, and standing eddy angular momentum transport. Data sources were rawinsonde observations, constant level balloon observations, satellite soundings, rocketsonde observations, satellite probing, and data collected by other studies. The stratospheric data available for a systematic study of the dynamics of the upper troposphere and the stratosphere are presented, and the primary data base to be used in the scientific studies is described. Progress made and plans for the coming year are summarized. An appendix is included which reproduces the cover page and table of contents of the second volume of the report concerned with trace constituents of the stratosphere.

48140 **APTIC NO. 69816**

Gerrish, Harold P.

LOW-LEVEL TEMPERATURE INVERSIONS IN THE MIAMI, FLORIDA AREA (FINAL REPORT). *Miami Univ., Coral Gables, Fla., National Park Service Contract CXOOO130019, South Florida Environmental Project Ecological Rept. DI-SFEP-74-17, 26p., July 1973. 12 refs.*

NTIS: PB 231630

A 268-foot tower was instrumented at the 5-foot, 105-foot, and 205-foot levels to investigate low-level temperature inversions in the vicinity of Site 14, the recommended location for the new Florida Regional Jetport. Data collected during the period from Feb. 22 to April 30, 1973 revealed that relatively strong ground-based inversions formed there nightly for an average duration of 14 hours. The maximum strength was 23 F in the 200-foot layer. Generally, the inversions were stronger with east winds which suggests temperature enhancement aloft by the heat plume from urban Miami. Therefore, urbanization creates poor dispersion conditions downwind from the heat island. Daytime inversions were observed for periods of 1 or 2 hr in association with troughs aloft, cold frontal passages, and sea-breeze fronts. The mean low-level temperature profile at rural Site 14 was that of an inversion. These results vividly show that low-level temperature inversions are quite pronounced in South Florida and, therefore, should be given paramount consideration in all air quality planning. (Author abstract)

48141 **APTIC NO. 69431**

Gjessing, Yngvar T. and Egil T. Gjessing

CHEMICAL COMPOSITION OF AN ANTARCTIC SNOW PROFILE. *Vatten, 29(3):233-237, 1973. 11 refs.*

Snow samples were taken in Antarctica and analyzed for zinc, copper, cadmium, and lead by atomic absorption spectrophotometry. Iron, chloride, ortho phosphate, total nitrogen, and nitrate were determined colorimetrically. A Beckman total carbon analyzer was used for organic carbon, and sulfate was determined nephelometrically. Except for sulfate and a few other elements, there was a significant concentration increase with depth. This phenomenon might be explained by the snow profile acting as a filter for the aerosols. The concentration decrease of sulfate with depth, however, suggests that the content of sulfur brought into the atmosphere by man has increased in Antarctica during the last decades. (Author summary modified)

48142 **APTIC NO. 69549**

Heicklen, Julian

PHOTOCHEMICAL SMOG: ITS CAUSE AND CURE. *Pennsylvania State Univ., University Park, Pa., Dept. of Chemistry, Center for Air Environment Studies, Rept. 299-73, 37p., May 1973. 78 refs.*

The formation and control of photochemical smog are described. Smog results from atmospheric reactions of hydrocarbons and oxides of nitrogen primarily emitted by automobile exhaust. When mixtures of hydrocarbons and NOx are irradiated with ultraviolet light, nitric oxide is tranformed into nitrogen dioxide, the NO2 photodissociates, and oxidants (primarily ozone) are produced. The mechanism involves a chain process in which hydroxide radical is the chain carrier. Increasing the NO concentration first enhances the production of NO2, but then retards production as the terminating reactions become more important than the propagating mechanisms. Increasing the hydrocarbon content always enhances the NO to NO2 conversion. Smog control can be effected by either reducing exhaust emissions through control devices or by adding substances to the atmosphere which can inhibit oxidant production. Atmospheric concentrations of 0.2 ppm of either benzaldehyde or aniline can markedly reduce the rate of conversion of NO to NO2. Oxidant production can be reduced by addiny 0.5 ppm C6H5CHO to a mixture of 1.0 ppm propene and 0.5 ppm NOx. The problems and costs of the two methods are discussed. (Author abstract modified)

48143 **APTIC NO. 69458**

Hicks, B. B.

A CLIMATOLOGY OF SOLID ATMOSPHERIC CONTAMINANTS AT ASPENDALE, NEAR MELBOURNE, VICTORIA, 1966 TO 1971. *Austr. Meteorol. Mag., 21(1):19-28, March 1973. 7 refs.*

Air concentrations of solid matter near the surface were recorded on a routine weekly basis since 1966 at Aspendale, Australia. These showed a gradual increase until late 1968, followed by a general decrease. Overall, the values were lower than usually reported in urban areas. Particulate concentrations were highest in conditions of light winds from the industrial areas located to the north and northwest. A correlation was found with mean maximum temperature, but no rainfall effect was found. Week-to-week dust concentrations varied statistically by about 20% (one standard deviation) and on a monthly basis this figure reduced to about 10%. The particle mass spectrum was maximum at about 25 micron diameter, given a mean sedimentation velocity of about 1.3 cm/sec which was supported by dust fall considerations. The average residence time of the dust observed at Aspendale appeared to be on the order of 11 hr. (Author abstract modified)

48144 **APTIC NO. 69519**

Ivlev, L. S.

AEROSOL PARTICLE SIZE SPECTRA IN THE SURFACE LAYER OF THE ATMOSPHERE. *(Formirovaniye spektra razmerov aerozol nykh chastits v prizemnom sloye atmosfery). Text in Russian. Dokl. Akad. Nauk SSSR, 210(1/3):335-338, 1973. 7 refs.*

The vapor aerosol particle size distribution was studied in the ground-layer of the atmosphere in different seasons and in different geographical environments by spectral density measurements. Modification of the size distribution function during the day as a result of the coagulation of particles and the ascension of particles into higher layers of the atmosphere with increasing temperature was observed. The temperature- dependence of the particle concentration is characterized by a bell-shaped curve. The maximum of the aerosol concentration in the ground layer during the evening hours is due to the descension of the particles from the higher layers, while the descension of iron oxides-containing particles falls on the late night hours. The existence of a fraction of solid aerosol particles, e.g., quartz, not coated by water, was established.

48145 **APTIC NO. 69895**

Klein, David H.

MERCURY IN THE ENVIRONMENT. *Hope College, Holland, Mich., Chemistry Dept., Environmental Protection Agency Proj. 16040 FRL, Program Element 1BA027, Rept. EPA-660/2-73-008, 28p., Dec. 1973. 9 refs.*

Soil, sediment, and water analyses for mercury were obtained from the characteristically low-metals environment of western Michigan and compared with levels of other metals to study distribution patterns resulting from the atmospheric discharge of mercury. Industrial point sources identified included: an asphalt plant, airports, and a coal-burning power plant. Assuming a mean mercury content of 0.3 ppm for the coal used, about 4 tons of mercury were expected to be present in nearby soil compared to the 0.05 tons actually found. This indicated that mercury discharged from the burning of coal deposits by a mechanism other than the short-term dry fallout associated with less volatile metals, presumably entering a different atmospheric circulation pattern and being dispersed over a much wider area. Mercury was associated primarily with suspended solids in local lakes and rivers. Concentrations of mercury, as well as other metals, in sediments correlated strongly with the organic content and the fraction of fine particulates. Sewage treatment plants also represented a large source of mercury discharge (about 1000 lb per million population); this mercury was associated primarily with the suspended solids.

48146 **APTIC NO. 69782**

Krouse, H. Roy

SULPHUR ISOTOPE ABUNDANCES AND ENVIRONMENTAL ASSESSMENT – APPLICATIONS TO SULPHUR GAS RESEARCH IN ALBERTA. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service, and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas res. Alberta, Edmonton, Alberta, 1973, p. 57-58. 12 refs. (Nov. 1-2.)*

Since the sulfur isotopes S(32) and S(34) differ in their masses, their relative numbers are altered by mass-dependent processes. In Alberta, hydrogen sulfide from different pools varies considerably in its S(34)/S(32) abundance ratios. This provides a means of monitoring gas industry emissions of sulfur compounds and their effects on the environment. Data from Alberta identify industrial contributions of sulfur dioxide to the air and show that these are not readily mixed on a local meteorological scale. Isotopic studies also show that licheas derive sulfur from the atmosphere in a more direct manner than higher plants. Sources of sulfur compounds in streams can also be identified. The sulfur isotope abundances in gas streams could be used to study the sour gas processing industry. (Author abstract modified)

48147 **APTIC NO. 66945**

Kummler, Ralph H. and Theodore Baurer

A TEMPORAL MODEL OF TROPOSPHERIC CARBON-HYDROGEN CHEMISTRY. *J. Geophys. Res., 78(24):5306-5316, Aug. 20, 1973. 31 refs.*

A temporal model of tropospheric carbon-hydrogen chemistry is described along with some conclusions resulting from the model. The Keneshea numerical integration technique is used, employing the Runge-Kutta-Merson system coupled with an interative solution of the first-order linear differential equations obtained by linearization of the actual equations for species studied in the steady state. The initial hypothesized atmospheric model includes only the oxidation of methane as a carbon monoxide source and indicates that CO concentration decreases to less than one third of the concentration found in present field observation data. Oxidation of CH4 to CO is concluded insufficient to sustain a globally averaged 0.15 ppm CO concentration, and it appears that oxidation of higher hydrocarbons must be a significant contributor to the CO balance. A model calculation for ethylene contribution of 3 times 10 to the 11 carbon atoms/cu cm brings predicted CO concentrations into agreement with field observations. An absence of diurnal variation for both methane and the higher hydrocarbon concentrations are assumed in the calculations. The observed diurnal variations in atmospheric CO data appear to reflect a source other than the homogeneous oxidation of all naturally occurring hydrocarbons. Fossil fuel combustion is one source of anthropogenic introduction.

48148 **APTIC NO. 69481**

Landsberg, H. E.

THE URBAN AREA AS TARGET FOR METEOROLOGICAL RESEARCH. *Bonner Meteorol. Abhandl., no. 17:475-480, 1973. 11 refs.*

NTIS: N74-27092

Weather predictions made by present procedures and with present network observations are inadequate for the needs of urban populations. The effects of surface changes brought about by urbanization on heat balance and wind field feedback into the synoptic pattern on a mesoscale. They affect pollution concentration, cloudiness, and precipitation. The primary causes are increased roughness and the urban heat island. Their effects become dominant when the general flow patterns are weak. Individual local models for forecasting are needed. (Author abstract)

48149 **APTIC NO. 69611**

Lee, E. S., S. C. Sarin, and K. M. Wang

PARAMETRIC TIME SERIES MODELING OF STOCHASTIC AIR POLLUTION DATA. *Southern California Univ., Los Angeles, Calif., Dept. of Electrical Engineering, National Science Foundation Grant AP-00895-01 and National Institute of Health Grant NIH-GM-16197-05, Rept. RB 73-15, 35p., April 1973. 7 refs.*

NTIS: PB 234416

Parametric time series modeling and spectral and cross spectral analyses are used for the analysis and correlatin of air pollution data obtained from field measurements at four monitoring stations in the greater Los Angeles area. Cyclic variations and the interconnections between various sources of emissions are estimated, and predictive mathematical models are developed for carbon monoxide, sulfur dioxide, nitrogen oxides, and ozone. Hourly data and 6-hour average data are used to establish the models. Concentrations between CO and NOx are highly correlated in general, with the correlation coefficient being about 90%. Ozone is not correlated with any of the other pollutants. The addition of such meteorological factors as wind speed and direction as well as inversion height to the models results in some improvement for the prediction of O3 and SO2 but no inprovement for CO and NOx predictions. Compared to autocorrelation models obtained previously from spectral analysis information, the present models have the advantage that the relationships are between pollutants and between stations. Thus, knowing the concentrations of one pollutant, the concentration of another pollutant which is closely correlated to this known pollutant can be predicted.

48150 **APTIC NO. 69379**

Lee, G. K., H. Whaley, and J. G. Gainer

PLUME DISPERSION RESEARCH AT NATURAL-GAS SULPHUR-EXTRACTION PLANTS. *Dept. of Energy, Mines, and Resources, Ottawa (Ontario), Canadian Combustion Research Lab., and Gulf Oil Canada Ltd., Calgary (Alberta), Exploration and Production Dept., Rept. R-265, 35p., March 1973. 2 refs. (Presented at the Canadian Natural Gas Producers Association Meeting, Calgary, Alberta, March 2, 1973.)*

A technique for determining dynamic plume behavior by direct measurement of the concentration and distribution of sulfur dioxide in space is described and a preliminary evaluation of four of the 19 plume studies to show the effect of selected meteorological and topographical conditions on both plume rise and the standard deviations of plume spread is given. At one plant, two plumes were studied, one under inversion conditions and the other under limited mixing conditions. In all four plumes, massive dilution of the stack gases occurred within 3 km of the source. Even under stable (inversion) conditions while dispersion was poor, the stack gas concentration had decreased by a factor of 2900 at 2.6 km downwind. The derived plume rise values showed good agreement with the Briggs equations for stable and neutral conditions. For limited-mixing conditions, the plume tended to level off at a constant height. The lateral plume spread, in each of the four cases, was much wider than would be estimated from empirical data. The vertical plume spread was strongly influenced by both the flare stack emissions and topographic effects close to the source; however, farther downwind (greater than 3 km) atmospheric stability had a major effect. (Author summary modified)

48151 **APTIC NO. 69513**

Longmire, Martin S.

STRATOSPHERIC PHOTOCHEMISTRY OF OZONE AND SST POLLUTION. *National Oceanic and Atmospheric Administration, Washington, D. C., National Environmental Satellite Service, NOAA-TM-NESS-47, Rept. NOAA-73042716, 34p., March 1973. 18 refs.*

NTIS: COM-73-10786

Current thinking on the stratospheric photochemistry of ozone is reviewed. The topic is particularly relevant to current plans for monitoring the stratosphere for climatic change and for determining other long-range effects arising from natural or human activities. Ozone and atomic oxygen are treated together as odd oxygen because they are converted to each other in the stratosphere through very rapid reactions. The reactions involved in the creation are classified into five sets. The reactions or chains of reactions considered most significant in determining stratospheric ozone are discussed in detail. Current thought is that the reactions involving nitrogen oxides dominate those that destroy odd oxygen. The discussion is restricted to ozone photochemistry; the effects of mass transport are entirely neglected. On the basis of this review, a list of stratospheric constituents whose distributions should be monitored globally is presented together with a suggested order of priority of observation. These are ozone (and atomic oxygen, if possible), nitrogen oxides, hydrogen oxides, acids of nitrogen, methane, sulfur dioxide, and carbon monoxide in that order. (Author abstract modified)

48152 **APTIC NO. 69506**

Machta, L.

GLOBAL SCALE ATMOSPHERIC MIXING. *Preprint, Second International Union of Theoretical and Applied Mechanics and International Union of Geodesy and Geophysics, 46p., 1973. 27 refs. (Presented at the Symposium on Turbulence in Environmental Pollution, Charlottesville, Va., April 8-14, 1973.)*

Information on the global distribution of known tracer substances (Freon-11, carbon dioxide, radon and its daughters, argon-37, and krypton-85) is presented along with a description of a simple two-dimensional atmospheric mixing model (vertical and north- south) based on the flux-gradient relationship. Freon-11, used as a propellant in spray cans, is stable under environmental conditions normally found in the troposphere and lower stratosphere and represents an excellent tracer for global scale motions. An estimated 3900 million lbs of the gas have been dissipated into the atmosphere between 1950 and 1972, with highest concentrations existing in the northern latitudes. Atmospheric carbon dioxide represents the sum of a large natural source plus a small amount increment due to the combustion of fossil fuels. Although the vertical diffusion coeffient for CO2 does not change if a seasonal variation in the vertical diffusion coeffient or the density is imposed, the flux at the upper boundary, the tropopause, does modify the diffusion coefficients. The two- dimensional mixing model described approximates an engineering rather than a first principle approach to the prediction of global scale dispersion since the main basis for the coefficients of vertical and north-south eddy diffusion comes from a fit to limited tracer information. Model prediction data are illustrated for tracer distribution and annual variation.

48153 **APTIC NO. 69616**

Mahoney, James R., Bruce A. Egan, and Edward C. Reinfenstein, III

HACKENSACK MEADOWLANDS AIR POLLUTION STUDY - DEVELOPMENT AND VALIDATION OF A MODELING TECHNIQUE FOR PREDICTING AIR QUALITY LEVELS (FINAL REPORT). *Environmental Research and Technology, Inc., Lexington, Mass., Office of Air and Waste Management Contract EHSD 71-39, ERT Proj. P-244-2, Rept. EPA-450/3-74-056-c, 92p., July 1973. 11 refs.*

The development and validation of an atmospheric diffusion model for calculating air quality concentration patterns related to four alternative land use plans for the New Jersey Hackensack Meadowlands area (year 1990) are described. The basic goal of the model development and validation effort is the calculation of seasonal and annual average concentrations of sulfur dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, and suspended particulates. The model is useful both as a stand-alone tool and as an element within the framework or a total land use planning-air pollution impact evaluation system. Calibration and validation runs were made for summer, winter, and annual time periods using meteorological input data from Newark Airport and point, line, and area source emission inventory data developed for the year 1969. Specific modifications made to the model to improve its accuracy included the adoption of a half-life for SO2 emissions, the inclusion of dispersive spread statistics more characteristic of urban areas, and the incorporation of wind speed variations with height above ground. The final calibration of the model used pollutant measurement data from five stations surrounding the Meadowlands region to develop calibration factors applicable to the individual locations and for the Meadowlands region in general.

48154 **APTIC NO. 69959**

Nordo, Jack, Anton Elaissen, and Jorgen Saltbones

LARGE-SCALE TRANSPORT OF AIR POLLUTANTS. *International Union of Theoretical and Applied Mechanics, Brussels (Belgium) and International Union of Geodesy and Geophysics, Paris (France), Symp. Turbul. Diffus. Environ. Pollut., Charlottesville, Va., 1973, vol. 18B:137-150, 1974. 1 ref. (April 8-14.)*

Daily air pollution measurements in Scandinavia showed that incidents of markedly acid precipitation and highly polluted air appear 20-30 times a year. Some of these episodes are analyzed, and transport of pollutants is discussed. The numerical transport model for sulfur dioxide and sulfuric acid is described and applied to air pollution episodes in Southern Norway. Model estimates are also made of concentrations due to local and distant sources.

48155 **APTIC NO. 69677**

Pasquill, F.

LIMITATIONS AND PROSPECTS IN THE ESTIMATION OF DISPERSION OF POLLUTION ON A REGIONAL SCALE. *Meteorological Office, Bracknell (England). Boundary Layer and Research Branch, MO Rept. 14, Turbulence Diffusion Note 35, 24p., 1973. 8 refs. (Presented at the IUTAM-IUGG Symposium on Turbulent Diffusion in Environmental Pollution, Charlottesville, Va., April 8-14, 1973.)*

Atmospheric dispersion theories are discussed using the concepts of statistical theory, gradient transfer, and similarity. The application and limitations of the theories are noted. Atmospheric flow properties of principal concern in the transport and dispersion of pollution on a regional scale are discussed including the large-scale horizontal component of turbulence, vertical mixing and convection over the whole depth of the boundary layer, the diurnal cycle of the mixing layer, and the large-scale vertical motions of the atmosphere. Future aims of dispersion studies are also described. (Author summary modified)

48156 **APTIC NO. 69332**

Peyinghaus, W. and H. C. Korff

ACTIONOMETRIC MEASUREMENT OF ATMOSPHERIC TURBIDITY. *(Bestimmung der atmosphaerischen Truebung aus Aktionometermessungen). Text in German. Ann. Meteorol., vol. 6 or 8:319-320, 1973. 7 refs.*

The direct solar radiation was measured for the whole spectrum and three subdivisions by means of a Linke-Feussner pyrheliometer to determine Angstrom s turbidity coefficient and Linke s turbidity factor. Angstrom s turbidity coefficient was determined from the difference of the direct solar radiation as calculated from the solar constant and the extinction of the gases and the actual radiation intensity. Four intensity values were determined per measurement, without a filter and with Schott s glass filters, in the respective ranges of 0.525-2.8 micron, 0.630-2.8 micron, and 0.710-2.7 micron. Apart from the evaluation of the actinometer measurements, the calculation method was also suitable for the determination of the intensity of the direct sun radiation at ground level with the atmospheric conditions known, allowing for arbitrary variations of all attenuation components, such as water vapor, carbon dioxide, ozone, haze, and air.

48157 **APTIC NO. 62342**

Pollack, R. I.

A PREDICTIVE MODEL BASED ON THE RELATIONSHIP BETWEEN METEOROLOGICAL AND EMISSION PATTERNS AND AIR QUALITY. *Preprint, California Univ., Livermore, Lawrence Radiation Lab., 4p., Feb. 1973. 5 refs. (Presented at the Conference on Probability and Statistics in Atmospheric Science, 3rd, Boulder, Colo., June 19-22, 1973, Paper Conf-730610--2.)*

NTIS: UCRL-74577

The formulation of a predictive model based on the relationship between meteorological and emission patterns and air quality is described. Fundamental relationships involving frequency distributions of pollutant concentrations and their predictors were calculated and show that a direct relationship exists between meteorological conditions, source distribution, initial concentration, and pollutant concentration. Air quality data may be used as a partial substitute for meteorological data. This practice is supported by previous results that indicate a high degree of correlation between pollutant concentrations, particularly those of inert pollutants, wind speeds. It is likely that other situations will arise where pollutant concentrations will serve as tracers of atmospheric motion.

48158 **APTIC NO. 69334**

Queck, H.

CHARACTERIZATION OF ATMOSPHERIC TURBIDITY BY MEASURING THE SOLAR RADIATION INTENSITY VERTICAL PROFILE IN THE VISIBLE SPECTRAL RANGE. *(Charakterisierung des Truebungszustandes der Atmosphaere aus Messungen des Vertikalprofils der solaren Strahlungsintensitaet im sichtbaren Spektralgebiet). Text in German. Ann. Meteorol., vol. 6:315-318, 1973. 5 refs.*

The variability of the incoming and reflected shortwave-ratiation at 550 and 684 nanom was measured by means of a special radioprobe. The results are compared with simultaneous lidar and radar measurements. The influence of the turbidity-generating atmospheric layers on the shortwave radiation balance is shown. Atmospheric turbidity influenced both the incoming and reflected solar radiation and its spectral energy distribution. Since the reflectance of a turbidity-generating layer is greater for diffuse than for parallel incoming radiation, it is a function not only of geometrical parameters, e.g., the direction of the incoming radiation, but also of the reflectance of the ground and of the particle size distribution of atmospheric aerosol particles. Occurrence of aerosol particles with radii over 0.5 micron in the turbidity-generating layer was demonstrated.

48159 **APTIC NO. 67076**

Ragland, Kenneth W. and J. Jeffrey Peirce

AIR POLLUTION DUE TO HIGHWAY TRAFFIC. *Wisconsin Univ., Madison, Inst. for Environmental Studies, National Science Foundation, Research Applied to National Needs Grant GI-29731, NSF-RA-E-73-025, Working Paper 13, 38p., Sept. 1973. 9 refs.*

NTIS: PB 228691

A mathematical model is presented for the atmospheric dispersion of pollutants from highway traffic. It overcomes many of the limitations of the Gaussian plume mode. A rational scheme is presented for calculating wind and diffusivity profiles, in contrast to using the Gaussian dispersion coefficients which are dependent in an unknown way on the local surface roughness. The wind may be parallel to the roadway or at an anglye to the roadway. The width of the roadway is also taken into account. The ambient air concentration of pollutants is obtained by numerical solution of the differential equation for conservation of mass of a dilute species. The results of the calculations for 23 major routes in Madison, Wis., are shown in an appendix. (Author abstract modified)

48160 **APTIC NO. 69450**

Schiff, H. I. and J. C. McConnell

POSSIBLE EFFECTS OF A FLEET OF SUPERSONIC TRANSPORTS ON THE STRATOSPHERIC OZONE SHIELD. *Rev. Geophys. Space Physics, 11(4): 925-934, Nov. 1973. 32 refs.*

The possibility that large quantities of water and various oxides of nitrogen can be injected into the stratosphere by a fleet of supersonic transports has raised concern over the possibility of a reduction in the ozone shield. Calculating such a reduction requires knowledge of the roles of NOx and water in the natural O3 budget. Initially, not enough was known either of the background densities of NOx or of many of the rate constants involved to make quantitative statements of the effect of NOx and H2O on the budget O3 budget. Recently, many of the rate constants required in a quantitative analysis have become known. These results incorporated into model calculations with natural sources of NOx and observed H2O mixing ratios tend to indicate that these constituents play an important role in the O3 budget in the natural stratosphere. At the same time, recent measurements of nitric oxide, nitrogen dioxide, and nitric acid have become available. The HNO3 measurements by several different groups are mutually consistent. The results of both the NO measurements and the NO2 measurements, however, differ by an order of magnitude. Although the rate data available are not of sufficient accuracy to resolve the discrepancy between the measurements, it does appear that there will be a reduction in stratospheric O3 caused mainly by hydroxide or nitrogen oxide catalysis or both. A semiquantitative analysis for a fleet of supersonic transports suggests a decrease in the column density of O3 of 0.5-5%. (Author abstract)

48161 **APTIC NO. 69476**

Schwarzbach, Martin

VOLCANOES, CONSIDERED BY A PALAEOCLIMATOLOGIST. *(Vulkane, vom Palaeoklimatologen betrachtet). Text in German. Bonner Meteorol. Abhandl., no. 17:575-596, 1973. 93 refs.*

NTIS: N74-27092

The relationship between volcanoes and climate are described. Climate influences the formation and activity of volcanoes. Volcanoes influence essentially the whole climate of the earth by emitting carbon dioxide and ash dust into the atmosphere. The influence of volcanic dust on the albedo of ice is small.

48162 **APTIC NO. 69393**

Trout, Dennis A.

AIR POLLUTION AT MESO-SCALE DISTANCES FROM LARGE URBAN COMPLEXES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 15p., 1973. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., 1973.)*

Concentrations of air pollutant emissions from large urban complexes were measured to distances of greater than 150 km downwind. This mesoscale transport of air pollutants from large urban complexes may be of particular importance to rural areas as well as other urban centers downwind, for example, the Eastern Seaboard Megalopolis. The results of the field study indicated that an effective point source model may be used to provide reliable estimates of sulfur dioxide concentrations to distances of 150 km from the urban complexes of St. Louis, Missouri and Alton, Illinois under atmospheric conditions of sustained, elevated, low-level inversions with persistent steady winds. More than 90% of the observed concentrations fell within a factor of two of the predicted values. Further, no systematic errors were found. (Author abstract)

48163 **APTIC NO. 69325**

Werner, Christian

LIDAR MEASUREMENTS OF THE THERMIC STRUCTURE IN THE TROPOSPHERE. *Preprint, German Establishment for Aeronautical and Space Research, Oberpfaffenhofen (West Germany), Inst. of Atmospheric Physics, 6p., 1973 (?). 7 refs.*

Lidar measurements can be used to detect inversion layers and cloud structures in the troposphere. The basis of the measurements is the simple aerosol lidar which measures aerosol particles which change radii with a change of the relative humidity. A variation of the relative humidity in the atmosphere caused by ascended moist air, i.e., thermal plumes, induces the aerosol particles to change their radii within a defined time interval. It is possible to detect this change by aerosol lidar. During the determination of the precipitable water by the absorption method at 6942.37 A units with two lasers at a telescope, the variation of the backscatter values was measured. The course of the values of the backscatter coefficient was plotted as a grey-scale for different altitudes. Inhomogeneity of the troposphere with their short time variation was seen. The results of measurements in the fall of 1972 are presented. The field results and an empirical relation can be used to determine the humidity thermic.

48164 **APTIC NO. 67146**

Wesolowski, J. J., B. R. Appel, A. E. Alcocer, P. K. Mueller, R. Ragaini, and R. Kaifer

CHEMICAL MEASUREMENTS OF CALIFORNIA ATMOSPHERIC AEROSOLS. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 13-19. 32 refs. (Oct. 17-18.)*

The measurements of the chemistry of aerosols in California ambient air are reviewed. Measurements are needed to determine what control program to use to reduce the deleterious effects of air pollution on visibility and public health. They are closely related since the size range which scatters light and reduces visibility is also respirable and has a large mass concentration. Examples of measurements of the concentrations of specific elements as a function of time, space, and particle size were related to specific objectives: the identification of an industrial polluter, the determination of the representativeness of sampler location, and the determination of the production mechanism for specific elements in particulate matter. Experimental evidence is presented that the use of non-sticky collection surfaces on size-segregating impactors causes sufficient inaccuracies to make the determination of production mechanisms based on the size distributions measured invalid. (Author summary modified)

48165 **APTIC NO. 70187**

Wu, Mao-Fou

OBSERVATION AND ANALYSIS OF TRACE CONSTITUENTS IN THE STRATOSPHERE. *Environmental Research and Technology, Inc., Lexington, Mass., Dept. of Transportation Contract DOT-OS- 20217, Rept. ERT P-393, DOT-TST-74-7, 236p., July 1973. 255 refs.*

NTIS: PB 231958

A detailed survey and extensive analysis of atmospheric trace constituents in the stratosphere are presented. Topics covered include: the distribution of ozone, water vapor, methane, carbon monoxide, carbon dioxide, nitrous oxide, nitrogen oxides, and nitric acid; diurnal, monthly, seasonal, annual, and geographical variations in distribution; balloon measurements of ozone (0-30 km); ozone concentrations in the troposphere, lower stratosphere, middle stratosphere, upper stratosphere, and mesosphere; in situ and remote sensing measurements of water vapor; humidity models; and the basic physics of trace constituents, including chemical reactions and major unsolved problems for each of the constituents. Data on the above topics are compiled in the form of various graphs and tables. The results of a study to derive large- scale eddy coefficients in the stratosphere using ozone analysis are included as an appendix.

1972

48166 **APTIC NO. 69441**

Beaton, John L., Andrew J. Ranzieri, Earl C. Shirley, and John B. Skog

AIR QUALITY MANUAL. VOL. V. APPENDIX TO VOL. IV (INTERIM REPORT). *California Dept. of Public Works, Sacramento, Div. of Highways, Dept. of Transportation Contract FH-11-7730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-37, CA-HWY-MR6570825(4)-72-08, 110p., April 1972.*

A series of curves showing the relationship between ground level pollutant concentration ratio and distance from pollutant source are presented. A series of curves giving vertical and horizontal dispersion parameters are included. The ground level concentration ratio versus distance curves are divided into four groups: at grade sections where the wind is not parallel to the highway alignment; elevated sections and non-parallel wings; cut sections and non-parallel winds; and varied highway sections with parallel winds. (Author abstract modified)

48167 **APTIC NO. 69444**

Beaton, John L., Andrew J. Ranzieri, Earl C. Shirley, and John B. Skog

AIR QUALITY MANUAL: VOL. VI. ANALYSIS OF AMBIENT AIR QUALITY FOR HIGHWAY PROJECTS (INTERIM REPORT). *California Dept. of Public Works, Sacramento, Div. of Highways, Dept. of Transportation Contract FHO1107730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-38, CA-HWY-MR657-825(5)-72-07, 110p., April 1972. 22 refs.*

A manual on the interaction between air pollutant sources and meteorological conditions contributing to the ambient air quality of a community is presented. Air pollutant sources within a highway corridor normally include stationary and mobile sources. Stationary sources include domestic heaters, industrial installations, and power plants. Mobile sources include motor vehicle traffic on highways, local roads, and streets. Guidelines are presented to determine the present ambient air quality along a proposed highway corridor from existing air monitoring station data; determine the present ambient air quality by performing an on-site air quality survey; and perform a mesoscale analysis of ambient air quality. Detailed information of the quality of ambient air over California cities is included. The contaminants measured were oxidants, carbon monoxide, sulfur dioxide, nitric oxide, nitrogen dioxide, total oxides of nitrogen, total hydrocarbons, and suspended particulates. (Author abstract modified)

48168 **APTIC NO. 70192**

Delsol, Catherine

THE END OF THE BLUE SKY. THE SUPERSONIC JETS. *(La fin du ciel bleu. Les supersoniques). Text in French. Paris, Editions Artheme Fayard, 1972, 151p.*

Environmental problems of supersonic jets are described in connection with the development of Concorde and Tupolev and of the abandoned SST project. The environmental consequences of regular supersonic flights are rated as catastrophic because supersonic jets, apart from generating intolerable noise, emit enormous quantities of pollutants, such as carbon particles, sulfur dioxide, nitric oxide, and water vapor mostly in the stratosphere which, contrary to the troposphere, possesses very limited self-purification capacity. The water vapor emitted by supersonic jets in the stratosphere is rated as a pollutant due to its large quantity and to the fact that, together with the other emissions, causes temperature increase and ozone decay in the stratosphere, whose most dangerous consequences would be greatly increased cloudiness and greater exposure of the earth surface to carcinogenic ultraviolet rays.

48169 **APTIC NO. 69960**

Ferland, Ross E. and John R. Howell

WATER VAPOR, CO2 AND PARTICULATE EFFECTS ON THE ATMOSPHERIC TEMPERATURE PROFILE. *Heat Transfer Fluid Mech. Inst., Proc., Northridge, Calif., 1972, p. 146-162. 15 refs.*

A new approach for the determination of the atmospheric temperature profile is described in which various concentrations of carbon dioxide, water vapor, and scattering particles are introduced to determine the perturbing effects on the temperature distribution in the atmosphere. The solution is gained through the combination of the Edwards exponential wide-band model equations and the Curtis-Godson transformation. The Curtis-Godson technique allows a transformation from the equations for a nonisothermal medium to those for the isothermal case; the Edwards band model equations provide a means of finding the absorption characteristics of the CO2 and water vapor. The basic radiation equation of transfer is coupled with an energy balance equation through the use of a wide-band model derivative approximation which reduces the complexity of the analysis considerably. An approach is developed for the inclusion of particle scattering. The simple case of elastic scattering is considered, and the equations are treated in a manner which allows the wide-band model derivate approximation to be used again. The doubling of the CO2 concentration produced a 1.89 K increase in the ground level temperature. Halving the concentration caused a decrease of 1.94 K. These results agree reasonably well with those obtained by other investigators. In addition, since only a 25% increase in the concentration of CO2 is expected from 1900-2000 AD, there is no threat of a significant ground level temperature change due to the increase of CO2 in the atmosphere. In fact, the introduction of water vapor and scattering can negate the effects of CO2 completely. (Author abstract)

48170 **APTIC NO. 69499**

Ivlev, L. S.

PROBLEMS OF PHYSICS OF THE ATMOSPHERE. *Probl. Fiz. Atmos., no. 10:92-103, 1972. 11 refs. Translated from Russian. Air Force Systems Command, Wright-Patterson AFB, Ohio, Translation Div., FTD-HC-23-1639-74, 16p., June 14, 1974.*

NTIS, DDC: AD 782531

Balloon investigations of atmospheric aerosol were carried out to explain the following questions: the statistical principles of the existence of aerosol layers at different altitudes, and the stability of these formations and their thickness, determination of the mechanisms of aerosol layer formation at different altitudes and atmospheric characteristics which affect formation of layers of turbidity, smoke, and fog; study of the effect of aerosol layers on variation of some atmospheric characteristics such as air temperature; complex investigation of the relationship of the meteorological elements and the aerosol characteristics; and study of the microstructure of the atmospheric aerosol. The balloon measurements of the vertical distribution of the atmospheric aerosol were carried out using impactor type aerosol traps during the summer and fall of 1964, 1966, 1967, 1968, and 1969. Thy particle size distribution, temperature, relative humidity, direct solar radiation or sky brightness, vertical distribution of aerosols, and presence of cyclones and anticyclones were measured.

48171 **APTIC NO. 69951**

Kuhn, P. M.

PARAMETERIZING CONTINUUM RADIATION TO REMOVE THE CALCULATED- OBSERVED RADIATION-TRANSFER DISCREPANCY. *Preprint, National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., p. 149-160, 1972 (?). 12 refs.*

Numerous balloon and aircraft radiometric profiles have provided the observations necessary to make detailed examinations of the discrepancy between observed and in situ calculated infrared radiant-power profiles in the atmosphere. The observations and concurrent calculations of the downward flux, even in cloudless atmospheres, repeatedly reveal a striking discrepancy between the magnitude of the two power profiles. The discrepancy averages (0.7 ly/min) 49 w/sq m for broadband hemispheric flux, narrow-spectral band (10-12 micron), narrow-field (2.5 mrad) radiometric observations of downward radiance in cloudless atmospheres averages .00027 w/sq cm/sr at 7.0 km. By a simple model transfer integral for atmospheric aerosol employing a mean absorption coefficient of 1.0 times 10 to the -7th power sq cm/g, it is possible to bring the calculation into general agreement with the observation. Similarly for a cirrus clouded atmosphere, with an absorption coefficient equal to 8 times 10 to the -5th power sq cm/g, it is possible to adjust calculations to agree with observations through cloudy atmospheres. To complete the calculations to give the best agreement with observations, as observed in cloudless and assumedly haze-free atmospheres, the absorption coefficient for the molecular constituents of the atmosphere, principally the continuum, was set equal to 0.2 sq cm/g. (Author abstract)

48172 **APTIC NO. 69457**

Nyberg, Alf

THE EFFECTS OF LOCAL AND DISTANT SOURCES OF SULFUR ON THE PRECIPITATION CONTENTS OF SULFUR IN SCANDIVANIA. *Geophysica (Helsinki), 12(1):33-42, 1972. 4 refs.*

A model is presented describing the transport of sulfur dioxide in the atmosphere. The model is applicable in a general way. It was tested with data on the SO2 emission in Europe and on measured fallout in precipitation at several places in Germany and Scandinavia. Most fallout of sulfur in precipitation in the countryside in Sweden had its origin in European countries outside Scandinavia. In areas close to cities and industrial sites, more than half of the fallout in precipitation was generally due to local sources. Similar conclusions may be drawn for other Scandinavian countries. The emission of sulfur dioxide consists of about 30% which is adsorbed by plants, buildings, and water surfaces, less than 20% which falls within a radius of less than 100 km from the source, and somewhat more than 50% which is carried far away and is deposited with precipitation. (Author abstract modified)

48173 **APTIC NO. 67065**

Pueschel, R. F., H. T. Ellis, L. Machta, G. F. Cotton, E. C. Flowers, and J. T. Peterson

NORMAL INCIDENCE SOLAR RADIATION TRENDS ON MAUNA LOA, HAWAII. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., Mauna Loa Observatory, Hilo, Hawaii, Environmental Protection Agency, Research Triangle Park, Div. of Meteorology, p. 164-168, 1972 (?).*

Incident solar radiation measurements at Mauna Loa, Hawaii, are presented. The transmission factors presented are fractions of the apparent extraterrestrial radiation in the Langley plots, which is approximately 10% lower than the true solar constant. The transmission factors are shown as functions of time for 1958-1971. The quantitative relationships between transmission and time for the periods from Jan. 1958 to March 1963 and from April 1963 to Dec. 1971 are shown. The record revealed a seasonal variability with a minimum of atmospheric transmission in early summer. During a period of relative volcanic quiescence between 1958 and 1963, the amplitude of this periodicity was 0.4% of the annual average transmittance level. In April 1963, the station record experienced a sharp decrease associated with the dust from the March 1963 Mt. Agung volcanic eruption. Additional volcanic eruptions subsequent to 1963 apparently delayed the recovery of atmospheric turbidity to its background levels. Since about 1969, the receipt of normal incident solar radiation at Mauna Loa has been similar to that found before 1963. There has been no detectable trend in normal incident solar radiation due to the emission of particulate matter from human activities. Higher turbidities in summer may be due to longer aerosol residence times and greater particulate load of tropical atmosphere from higher latitudes. The lower atmospheric transmissions during the summer could be the result of increased photochemical aerosol formation caused by the oxidation of volatile organic materials of plant origin. Increased atmospheric water content during the summer could yield higher turbidity values.

48174 **APTIC NO. 69921**

Robbins, R. C. and L. A. Cavanagh

ATMOSPHERIC MEASUREMENT OF PHOTOCHEMICAL SMOG REACTIONS - A PRELIMINARY ANALYSIS (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-0010 and Coordinating Research Council Contract CRC-APRAC-CAPA-7-70-12, SRI Proj. 1035, Rept. EPA-650/4-74-037, 60p., Feb. 1972. 10 refs.*

NTIS: PB 210422

Feasibility studies and field measurements were performed to determine whether the San Francisco Bay Area might provide meteorological and photochemical smog patterns that are especially conducive to field research on smog reaction processes. Weather patterns in the Bay area were such that air pollutants were such that air pollutants were carried over the waters of the Bay during almost all typical weather conditions. Local oxidant measurements indicated that photochemical smog persists even after the contaminated air mass moves over the water. The climatological studies and oxidant samplings indicated that the Bay can provide valuable data on the atmospheric conditions that occur in the time sequence during the development of photochemical smog, provided that atmospheric data can be gathered over the Bay waters, particularly east and south of San Francisco. A more comprehensive program involving the measurement of nitrogen oxides, hydrocarbons, formaldehyde, and carbon monoxide, in addition to oxidants, can provide a means of analysis of real photochemical smog systems because of the undisturbed course of photochemical reactions in the Bay air masses where fresh reactants are not introduced.

48175 **APTIC NO. 70130**

Rozenberg, V. I.

SCATTERING AND ATTENUATION OF ELECTROMAGNETIC RADIATION BY ATMOSPHERIC PARTICLES. *(Rasseyaniye i oslableniye elektromagnitnogo izlucheniya atmosfernymi chastitsami). Leningrad, Hydrometeorological Press, 1972, 348p. 330 refs. Translated from Russian. Techtran Corp., Glen Burnie, Md., 344p., Feb. 1974. National Aeronautics and Space Administration Contract NASw-2485, Rept. NASA TT-F-771.*

NTIS: N74 19017

The scattering and attentuation of centimeter, millimeter, and submillimeter electromagnetic radiation by atmospheric particles is developed. Using computerized techniques in conjunction with classical theory extended to the case of a nonconcentrically layered dielectric properties of its layers the fundamental radar characteristics (scattering cross sections, attenuation cross sections) of a series of hydrometeors are analyzed, taking into account their surface properties, the layered characteristics of their structure, and various regular aspects of distribution of density and permittivity. An extensive theory of the scattering and attenuation of electromagnetic radiation by arbitrary collections of such particles is constructed, allowing for multiple radiation exchange between them. Mie expressions for a polydisperse medium follow from this theory when certain ad hoc assumptions are made, thus enabling the theoretical radiometeorological models to be very closely represent actual process occurring in the atmosphere. Numerical values of permittivity of water over a wide range of temperatures and wavelengths are listed in an appendix.

1971

48176 **APTIC NO. 67054**

Shaw, R. W. and R. E. Munn

AIR POLLUTION METEOROLOGY. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 53-96. 88 refs.*

Atmospheric models and methods for studying air pollution meteorology are discussed. The meteorological elements most relevant in the study of dispersion of pollutants are the wind and the vertical temperature gradient. Other elements of secondary importance are precipitation, visibility, turbidity, and solar radiation. Models of urban and regional air pollution can predict the concentration patterns of pollutants based on the meteorological conditions and the distribution of multiple emissions within a given area. The predictions are applied either on a day to day or on a climatological basis. Day to day predictions provide forecasts of episodes when air pollution alerts are necessary. Climatological predictions are of value in regional land use planning by permitting estimates of the effects of proposed rezoning and fuel type changes. The source oriented approach is to make an inventory of all emissions, to undertake a separate diffusion calculation for each source, and to superimpose the resulting pollution patterns upon each other. Emissions from large factories and generating plants are point sources, while residential heating units are area sources. A receptor oriented approach of an estimate of the pollution arriving at each of many fixed grid points from sources located in angular upwind segments centered on the receptor is made.

48177 **APTIC NO. 69436**

Wessels, H. A. R. and J. A. Wisse

THE PLUME OF A LARGE COOLING TOWER. PART 2. *(De pluim van een grote koeltoren). Text in Dutch. Royal Dutch Inst. of Meteorology, De Bilt (Netherlands), Rept. W. R. 72-3, 14p., 1971. 4 refs.*

NTIS: N74 27142

Wet cooling tower plumes are considered in terms of causing fog and precipitation. Although hardly any fog is expected at ground level if the effective height of the cooling tower is in excess of 150 m, downwash in the lee of the cooling tower during strong winds is capable of causing the visible part of the plume at heights two to four times the tower height to reach the ground. The theoretical possibility also exists that at temperatures below minus 5 C artificial freezing nuclei might cause a Bergeron-type of snow formation in the plume. Large temperature excess in the plume can cause problems in using certain types of models to explain its behavior. In contrast to a normal chimney plume described by the Pasquill dispersion model, a significant temperature rise may exist in cooling tower plumes at distances exceeding a few kilometers. Under these conditions, the plume itself will determine to a certain extent its own dispersion. Morever the temperature distribution is favorable for bifurcation; thus, differences between the plume lengths during the day and evening may be overestimated.

1970

48178 **APTIC NO. 69907**

Federer, Bruno

NEUTRON ACTIVATION DETERMINATION OF THE AEROSOL CONTENT OF GREENLAND SNOW. *Pageoph., 79(2):120-127, 1970. 20 refs.*

Concentrations of sodium, chlorine, and sulfate were measured as a function of time in the snow from Jarl-Joset, Greenland. Large sulfate to chloride ratios and a strong parallelity between sulfate and sea salt components were obtained in the period 1880 to 1968. The sulfate to chloride ratio in polar snow was at least 20 times higher than in sea water. The excess sulfate is probably a result of a gas to particle reaction of sulfur dioxide and hydrogen sulfide. The parallelity clearly indicates a marine origin of the sulfate. (Author abstract modified)

48179 **APTIC NO. 69974**

Rossie, John P. and Edward A. Cecil

METEOROLOGICAL CONSIDERATIONS. *In: Research on Dry-type Cooling Towers for Thermal Electric Generation: Part I. Beck (R. W.) and Associates, Denver, Colo., Environmental Protection Agency Water Quality Office Contract 14-12-823, Proj. 16130 EES, p. 120-123, 209-210, Nov. 1970. 9 refs.*

GPO

The possible effects of dry-type cooling towers on local meteorological conditions are reviewed. They include changes in air temperature, cloudiness, fog, precipitation, and air currents. If there is an effluent discharge from the power plant associated with a dry-type cooling tower, the best place to vent the effluent would be in the updraft from the cooling tower. This would carry the pollutants into zones of higher winds where the particulates and gases would be greatly diluted and dispersed. Under certain meteorological conditions, the updraft may break through an inversion and disperse the pollutants above a layer they may have otherwise been trapped beneath. The comparative effects of various cooling methods are discussed including once-through cooling, cooling ponds, wet (evaporative) type cooling towers, and natural-draft versus mechanical-draft towers. Before a dry-type cooling tower is built, the meteorological implications of such a system must be modeled through analysis of actual observations. In general, the release of heat into the atmosphere from a dry-type cooling tower will be much less harmful to the environment than the combined release of heat and water vapor associated with other cooling methods. In addition, harmful effluents would be effectively dispersed by inclusion into the updraft from a dry-type cooling tower, whereas the combination of certain pollutants with wet plumes would compound rather than alleviate the pollution problem. While the dry cooling tower will not produce a measurable effect on a region's climatology, the worldwide buildup of thermal releases and the resultant climatological effects remain important considerations. Thus, on either a local or a global scale the subject of the meteorological effects of releasing large amounts of heat into the atmosphere raises many unanswered questions and should be studied extensively in the future. (Author conclusions modified)

1963

48180 **APTIC NO. 70056**

Labs, D. and H. Neckel

THE ABSOLUTE RADIANT INTENSITY OF THE CENTER OF THE SOLAR DISC IN THE SPECTRAL RANGE 6389 LESS THAN OR EQUAL TO LAMBDA LESS THAN OR EQUAL TO 12480 A. *Z. Astrophys., vol. 57:283-287, 1963. 5 refs. Translated from German, 9p.*

Absolute intensities for the center of the solar disc are given in the spectral range from 6389 to 12480 A. The infrared intensities were measured only in those spectral regions which are practically free from atmospheric absorption bands. The atmospheric extinction coefficient was also measured.

BASIC SCIENCE AND TECHNOLOGY

1974

48181 **APTIC NO. 66973**

Ahn, Chung H. and J. W. Gentry

THE SIMULATION OF AEROSOL GROWTH BY COAGULATION *Ind. Eng. Chem., Fundamentals, 13(4):361-366, Nov. 1974. 20 refs.*

A mathematical model was developed to describe the growth of aerosols generated by condensation of alkaline halide vapors. A computer code employing the invariant functional form model was written to solve the mathematical model. The computer algorithm was accurate and efficient. Simulated particle size distributions were not sensitive to the assumed initial values of the distribution. At higher oven temperatures, the particles became significantly larger, but the number concentration increased only slightly. The simulation was also compared with available experimental data. The simulation gave good agreement with the measurements for particle concentration of Ranade and the measurements of the mass median diameter by Ahn. The experiments of Ahn supported the contention that larger particles and not higher concentrations will result at higher oven temperatures. Quantitative agreement of the mass median diameter with temperature was satisfactory. (Author abstract modified)

48182 **APTIC NO. 69833**

Aoki, Nobuo, Toshihiro Kitada, and Masakatsu Hiraoka

A STUDY OF THE GENERATION OF ALDEHYDES IN PHOTOCHEMICAL SMOG. *(Taiki osen kokagaku hanno ni okeru arudehido rui no kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):153, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 6.)*

A reaction chamber filled with nitric oxide, hydrocarbons, and air is irradiated by air ultraviolet light, and the reaction products are analyzed and identified. The products are plotted against the irradiation time. When 1-butene was used, propionaldehyde was produced as an aldehyde product. The concentration of the aldehyde in the chamber increased for a certain period of UV irradiation; however, further irradiation caused a decreased concentration of propionaldehyde, indicating the adlehyde reactions with oxygen, ozone, or hydroxyl radicals.

48183 **APTIC NO. 69203**

Arai, Hiromichi, Masataka Kameyama, Hiroo Tominaga, and Taiseki, Koto

STUDIES ON THE STATE OF ADSORPTION OF NITROGEN OXIDE ON CATALYST SURFACES BY MEANS OF THE INFRARED ABSORPTION METHOD. *(Sekigai- kyushu-ho ni yoru shokubai hyomen-jo no sanka chisso no kyuchaku jotai ni kansuru kenkyu). Text in Japanese. Shokubai (Catalyst), 16(4):118-121, Sept. 1974. 7 refs.*

Infrared absorption studies were made on the reactivity and the molecular structure of the chemical species formed by nitric oxide and carbon monoxide adsorbed on rhodium-alumina catalysts. The state of adsorption of NO was similar to that of CO. However, the electronic state of NO changed to a large extent due to the absorption and donation of electrons by the catalyst. Thus cationic and anionic coordinations were noticed in the adsorbed NO. Both the NO and CO molecules were adsorbed or coordinated to the same metal atom just as 2 CO molecules are coordinated to a single metal atom. The formation of M-NCO was confirmed when the partial pressure of CO was higher than that of NO and when CO was adsorbed after the adsorption of NO. This compound was so stable that it cannot be a reaction intermediate. The catalysts used in the experiment were prepared as follows: the alumina prepared by the hydrolysis of aluminum isopropoxide was calcinated and then allowed to support 5 wt% of a chloride of the metal of the platinum group. The composite was calcinated at 400 C and then reduced with hydrogen. The product was then pelletized to form discs 0.1 mm thick and 20 mm in diameter.

48184 **APTIC NO. 69840**

Chisaka, Fumitake, Shigeru Yanagihara, and Isamu Shimada

COMPUTER SIMULATION OF PHOTOCHEMICAL REACTION (II). *(Kokagaku hanno seiseibutsu no densanki simurashion (dai 2-ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):160, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan) Nov. 6-8, 1974, Paper 13.)*

As a photochemical smog model, the ozone concentration is calculated in relation with the concentrations of propylene and nitrogen oxides as primary pollutants. The model considers 26 reactions for 20 chemical species with the variable of irradiation time, dilution rate, and primary pollutant emission rates. The model can be used for calculating the atmospheric ozone level; for example, less than 0.1 ppm ozone could be found if the initial propylene concentration was below 0.17 ppm and the propylene emission rate was 0.29 ton/hr/cu km.

48185 **APTIC NO. 70072**

Chisaka, Fumitake, Shigeru Yanagihara, and Isamu Shimada

ULTRAVIOLET ENERGY DISTRIBUTION AND MEASUREMENT IN SMOG CHAMBERS. *(Sumoggu chanba nai no shigaisen enerugi bunpi oyobi sokuteiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):152, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 5.)*

The energy distribution within rectangular and cylindrical chambers is calculated assuming that a single spotlight is travelling through the chambers. If solar radiation is simulated to pass through the same chambers, only 1/2.42 of the incident light could be measured by a detector; however, with an increase in the solid angly of the detector, measurement could be improved to 1/1.5. This irradiation chamber can be used for photochemical lab studies.

48186 **APTIC NO. 69599**

Chu, Chao-kang and Edgar Heckel

RADIATION INDUCED HYDROGEN FLUORIDE FORMATION IN FLUORINE CONTAINING ETHANES AND ETHENE. *Preprint, East Carolina Univ., Greenville, N. C., Dept. of Chemistry, 18p., 1974. 32 refs.*

Several fluorine containing ethanes and trifluorethane formed hydrogen fluoride when irradiated with gamma rays in the gas phase at 25 C. Identical hydrogen fluoride yields were observed both in the absence and presence of molecular oxygen (except for monofluoroethane), indicating that hydrogen fluoride is formed by molecular eliminaton. A reduction in the radiation chemical yield (number of hydrogen fluoride molecules formed per 100 electron volts of energy absorbed by the sample gas) with increasing sample pressure indicated that collisional stabilization of excited fluorethane molecules completes with the process of molecular hydrogen fluoride elimination. High radiation chemical yields for hydrogen fluoride and carbon dioxide in mixtures of trifluoroethane and oxygen indicated the occurrence of a chain reaction. (Author abstract modified)

48187 **APTIC NO. 69937**

Chu, Richard R.-C.

RADIATION-INDUCED PARTICULATES FROM ORGANIC VAPORS. *Georgia Inst. of Tech., Atlanta, Chemical Engineering Dept., Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-11,412, 168p. 138 refs.*

Ultrafine particulates were produced by X-ray or ultraviolet irradiation from trace hydrocarbons in air, with carbonyl and hydroxyl groups being identified as the predominant and characteristic components of these highly oxygenated products. Aldehydes, ketones, esters, and carboxylic acids were detected. Photochemical first-order reaction rate constants for cyclohexene, benzene, toluene, and o-xylene were determined in a photochemical smog chamber at 0.0019, 0.001, 0.0015, and 0.002/sec, respectively. At low concentrations of oxygen in nitrogen, the quantitative production of aerosol was roughly proportional to the oxygen content. Production of ozone occurred mostly by a combination of molecular and atomic oxygen. In general, hydrocarbon molecules reacted with atomic oxygen and ozone to form oxygen-containing radicals that recombined and added to hydrocarbon molecules through a series of complex reactions. Final reaction products included large amounts of aliphatic aldehydes and highly oxygenated particulates consisting of 63-81% of the reacted carbon atoms. Deformation of the particulates, the presence of agglomerates, and their mode of attachment to one another were examined by both transmission and scanning electron microscopy; the size and mass of all types of particulates appeared to increase in proportion to the irradiation time, aging time, hydrocarbon concentration, nitrogen oxide concentration, and relative humidity when under 5%. Condensation of supersaturated vapors and chemical combination of reactive species were proposed to describe the nucleation and growth of particulates.

48188 **APTIC NO. 69617**

Chun, Kyong Chul

CAPACITY OF FERRIC OXIDE PARTICLES TO OXIDIZE SULFUR DIOXIDE. *Northwestern Univ., Evanston, Ill., Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974, 151p. 71 refs.*

The heterogeneous oxidation of sulfur dioxide by ferric oxide particles in a Teflon lined filter-reactor was investigated to provide information on the capacity of ferric oxide particles to form sulfate in the presence of sulfur dioxide and air. The rate constant for the reaction was estimated from the quantity of sulfate formed at different exposure times, with the parameters being evaluated for different values of relative humidity, sulfur dioxide concentration, and particle Reynolds number. The capacity of ferric oxide particles to oxidize sulfur dioxide in air was 313 micrograms/5 mg Fe2O3, and the reaction rate constant for the heterogeneous reaction was as estimated 0.0094/ppm min, with these parameters being insensitive to either relative humidity or sulfur dioxide concentration. The average surface coverage with sulfate ions was estimated at 1.6 ions/100 sq A when the capacity was depleted. Neutralizaton of the sulfuric acid formed on the ferric oxide particles by exposure to ammonia in air increased the capacity of ferric oxide particles to form sulfate from 313 micrograms/5 mg Fe2O3 to 434 micrograms/5 mg Fe2O3. The quantity of sulfur dioxide physically adsorbed on ferric oxide particles at 23 C was negligible; and the quantity of iron dissolved in the sulfuric acid formed on the particles ranged from 0-7 micrograms/5 mg Fe2O3, indicating that most of the sulfuric acid formed remained on the particles unreacted. (Author abstract modified)

48189 **APTIC NO. 70108**

Cox, R. A. and F. J. Sandalls

THE PHOTO-OXIDATION OF HYDROGEN SULPHIDE AND DIMETHYL SULPHIDE IN AIR. *Atmos. Environ., 8(12):1269-1281, Dec. 1974. 27 refs.*

A preliminary investigation into the photooxidation of ppm concentrations of hydrogen sulfide and dimethyl sulfide in air containing nitrogen oxides and hydrogen peroxide vapor was carried out. The wavelength region used was 300-400 nm with light intensities of roughly 1/10 and 1/3 of natural sunlight. Both sulfur compounds underwent photooxidation under the conditions employed, and sulfur dioxide was a major product of the photooxidation of H2S but not of dimethyl sulfide. The nitric oxide sensitized photooxidation of dimethyl sulfide showed similar characteristics to that of simple hydrocarbons in that a rapid oxidation of NO to nitrogen dioxide occurred with the formation of ozone after most of the NO was converted to NO2. Hydrogen sulfide did not behave in this way and was much less reactive toward photooxidation than its organic homologue in the presence of NO. The addition of hydrogen peroxide vapor increased the rate of photooxidation of both sulfur compounds. The oxidation of the sulfur compounds resulted from their reaction with photochemical generated free radicals such as oxygen atom and hydroxyl radical; this is a major loss process for H2S and dimethyl sulfide in the lower atmosphere. (Author abstract)

48190 **APTIC NO. 65163**

Dabbous, Mahmoud and Paul F. Fulton

LOW-TEMPERATURE-OXIDATION REACTION KINETICS AND EFFECTS ON THE IN-SITU COMBUSTION PROCESS. *Soc. Petrol. Eng. J., 14(3):253-262, June, 1974. 11 refs. (Presented at the Society of Petroleum Engineers and American Institute of Mining Engineers Annual Fall Meeting, 47th, San Antonio, Tex., Oct. 8-11, 1972, Paper SPE 4143.)*

The kinetics of low-temperature oxidation (LTO) of crude oils in porous media was studied. Isothermal integral reactor data were analyzed to obtain rate equations for the over-all rate of the partial oxidation reactions at temperatures below 500 F. The reaction order with respect to oxygen was found to be between 0.5 and 1.0. The order of the reaction was dependent upon the crude oil but independent of the properties of the porous medium. The activation energy of the reaction was insensitive to the type of crude oil or porous medium and is in the neighboorhood of 31,000 Btu/lb mol. The reactions were in the kinetics-influenced region. The measured reaction rates for a 19.9 API and a 27.1 API crude oil indicated higher oxidation rates under similar reaction conditions for the higher API gravity crude oil. Light crudes appear to be more susceptible to partial oxidation at low temperatures because of their relatively high hydrogen content. Most of the reacted oxygen is consumed by hydrogen and hydrocarbon oxidation reactions rather than by carbon oxidation. Other information includes the fraction of reacted oxygen utilized in carbon atom oxidation by the LTO reaction and the molar ratio of carbon dioxide and carbon monoxide produced in the low-temperature region. Effect of partial oxidation of the crude oil on the in-situ combustion process was studied by experimentally simulating the zones preceding the combustion front where temperatures and injection rates of a linear reservoir model were programmed with time according to a predesigned schedule. Oxidation of the crude at temperatures below 400 F had significant effects on the behavior of the crude oil/water system in the porous medium at elevated temperatures and on the fuel available for combustion. A substantial decline in the recoverable oil from the evaporation and cracking zones, an increase in fuel deposition, and drastic changes in fuel characteristics and coked sand properties were obtained when the crude oil was subjected to LTO during the simulation process. (Author abstract)

48191 **APTIC NO. 69684**

Davis, Paul A.

ATMOSPHERIC TRANSMITTANCE MODELS FOR INFRARED RADIOMETRIC MEASUREMENTS FINAL REPORT. *Stanford Research Inst., Menlo Park, Calif., National Oceanic and Atmospheric Administration Contract 3-35208, SRI Proj. 2244, 89p., March 1974. 10 refs.*

Models for computing atmospheric transmittances appropriate to the specific response characteristics of infrared radiometers used in remote sensing were designed. Detailed computations of theoretical monochromatic transmittances for a variety of homogeneous paths as the basis for the transmittance modeling were used. Representations were derived for describing transmittance as a universal function of absorber amount, pressure, and temperature; and parameters defining the transmittance representations and temperature-dependent coefficients for scaling atmospheric paths were tabulated for most of the infrared channels of the Infrared Temperature Profile Radiometer and High-Resolution Infrared Radiation Sounder satellite instruments. A transmission function suggested by Godson was suitable in most cases, though the most comprehensive representation of the transmission function in terms of atmospheric variables resembled the Malkmus transmittance model. After exclusion of the continuum absorption, water vapor transmittances in excess of 0.995 in regions of weak absorption by rotational were found to be functions only of the temperature- scaled absorber amount, being insensitive to pressure. Successful representations of the transmittance for uniformly mixed gases (combined) were also obtained. In the regions of strong carbon dioxide absorption, channels 1 and 15 of HIRS, a satisfactory universal representation was achieved only by altering the form of the representation. A tentative representation of ozone transmittance (14 micron band) for ITPR channels 3-6 was designed on the basis of limited laboratory data, though it was not checked against direct theoretical computations of transmittance. (Author summary modified)

48192 **APTIC NO. 67119**

Finlayson, Barbara Jean

CHEMILUMINESCENT GAS PHASE REACTIONS OF OZONE WITH SELECTED OLEFINS. *California Univ., Riverside, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974. 340p. 46 refs.*

Laboratory experiments were performed to establish the generality of the phenomenon of chemiluminescence from low pressure gas phase ozone-olefin reactions at room temperature, to identify the light emitting species, to clarify their mechanisms of production, and to relate these to the overall mechanism of the ozone-olefin reaction. Electronically excited formaldehyde and vibrationally excited formaldehyde and vibrationally excited hydroxyl radicals were identified as emitting species common to all reactions in the presence and absence of oxygen. Light emission at 520 nm in a cis-2-butene-ozone reaction in oxygen was tentatively identified as glyoxal phosphorescence. The chemiluminescence quantum yields for the reactions of ethylene and cis-2-butene with ozone in oxygen were 10 to the minus 7 for formaldehyde fluorescence and, in the cis-2-butene reaction, 10 to the minus 4 for the glyoxal phosphorescence. The maximum value of the chemiluminescence quantum yield for the vibrationally excited hydroxyl radical was an estimated 10 to the minus 4 in these reactions. Decay curves for light intensity which are nonexponential with time in the absence of oxygen but exponential in its presence suggested that an initial fast reaction occurred, probably due in part to a mixing phenomenon. An observation of free radicals by either chemiluminescent emission or mass spectrometry in the low pressure ozone-olefin reaction suggested that a reexamination of general application of the Criegee mechanism of ozonolysis to the gas-phase reactions is necessary. (Author abstract modified)

48193 **APTIC NO. 69990**

Fuhrmann, Robert, Allen Tunick, and Louis Palmer

SYNTHESIS AND PURIFICATION OF CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBON STANDARDS (FINAL REPORT). *Allied Chemical Corp., Morristown, N. J., Corporate Research and Development, Environmental Protection Agency Contract 68-02-0545, Proj. 26 AEK, 42, Program Element 1AA010, EPA-650/2-74-040, 65p., July 1974. 16 refs.*

Attempts to prepare six condensed polynuclear carcinogenic hydrocarbons at a purity equal to or exceeding 99.9+% are described. The amounts to be prepared were 20 g of benzo(a)pyrene, 10 g each of benzo(a)anthracene, benzo(e)pyrene, chrysene, benzo(b)fluoranthene, and benzo(k)fluoranthene. Chrysene was the only compound prepared according to specification. No progress was made with benz(a)anthracene. Experimental details, analytical methods, and safety procedures are described. (Author abstract modified)

48194 **APTIC NO. 69547**

Gallily, Isaiah

THE DYNAMICS OF NONSPHERICAL PARTICLES. I. CONTROLLED GENERATION OF NONSPHERICAL AEROSOLS AND METHODS FOR THEIR SIZE, CONCENTRATION AND ELECTRIC CHARGE MEASUREMENT (FINAL TECHNICAL REPORT.. Hebrew Univ. of Jerusalem (Israel), Army Contract DAJA37-72-3875, 95p., Jan. 1974. 63 refs.

NTIS, DDC: AD 783437

Typical features of the motion of a nonspherical aerosol particle are presented along with a review of methods for aerosol generation, size measurement, concentration determination, and electric charge assessment. Starting with model shapes, almost perfect cubes or parallelpipeds were produced in the laboratory by solution spray-drying, and cylindrical particles of glass fibers were produced by suspension gas atomization. Studies of agglomerate size distribution associated with the latter method of generation indicated that the Poisson Distribution can not be assumed unquestionably. Dispersion of powders by air turbulence was treated theoretically, and a computational investigation of the adhesional energy between two parallelpipeds at various mutual orientations begun. Size parameters of the produced particles were determined in a scanning electron microscope with a photogrammetric method of observation which proved to be sufficiently accurate. The assessment of the electric charge of a nonspherical particle was analyzed in terms of its motion, including translational resistances. Experiments on the effect of Brownian rotation on the translation of an aerosol particle confirmed the direct relationship between the averaging phenomenon and time achieved. An apparatus for the determination of the principal resistances of a nonspherical particle at various Knudsen numbers was also constructed. (Author summary modified)

48195 **APTIC NO. 69711**

Gorchakov, G. I. and A. S. Yemilenko

MODELLING OF ATMOSPHERIC AEROSOL MICROSTRUCTURE AND LIGHT SCATTERING MATRICES. *(Modelirovaniye mikrostruktury atmosfernogo aerozolya i matritsy rasseyaniya sveta). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana. 10(4):350-359, 1974. 11 refs.*

Optical models of atmospheric haze are compared with measurements of light scattering matrices. Bullrich's and Deyrmendzhan's models are considered in particular, and two poorly correlating criteria: the maximum degree of linear polarization of the scattered light in illumination with unpolarized light, and the maximum degree of the elliptical polarization of the scattered light in illumination with linearly polarized light, are selected from among the optical characteristics. For haze, a refractive index of 1.5 was closest to the optimum. The influence of some parameters of aerosol microstructure on the optical properties of atmospheric air is presented.

48196 **APTIC NO. 75053**

Harte, John and Donald Levy

ON THE VULNERABILITY OF ECOSYSTEMS DISTURBED BY MAN. *California Univ., Berkeley, Lawrence Berkeley Lab., Atomic Energy Commission*

Contract W-7405-ENG-48, Rept. LBL-3214, 32p., Oct. 1974. 12 refs. (Presented at the International Congress of Ecology, 1st, The Hague, Netherlands, Sept. 8-13, 1974.)

The Liapunov stability theory is applied to models of energy and nutrient flow in ecosystems. The domain of stability under non-infinitesimal perturbations is discussed and significant differences are pointed out between models with and without detritus-decomposer feedback loops. Possible practical implications are suggested. Speculations concerning the role of fluctuations in ecosystems and the possibility of determining successional trends from an optimization procedure are discussed. (Author abstract)

48197 **APTIC NO. 69362**

Harvey, Richard D., Robert R. Frost, and Josephus Thomas, Jr.

LAKE MARLS, CHALKS, AND OTHER CARBONATE ROCKS WITH HIGH DISSOLUTION RATES IN SO2--SCRUBBING LIQUORS. *Illinois State Geol. Surv. Environ. Geol. Notes, no. 68:1-22, May 1974. 14 refs. (Presented at the Ohio Division of Geological Survey and Department of Geology and Mineralogy Forum on Geology of Industrial Minerals, 10th, Columbus, Ohio, April 17-19, 1974.)*

The relative dissolution rates of lake marls, chalks, and other carbonate rocks in simulated sulfur dioxide scrubbing liquors were investigated. Pulverized shells from deposits along the coasts have good potential for high rates of dissolution in SO2 scrubbing liquors, as does oolitic aragonite sand. There was a very high rate of dissolution for a calcitic waste sludge material. Chalks are more reactive than most limestones, and lake marls are likely to be more reactive than dense, fine-grained limestones. Lake marl because of the ease of its production and its high degree of disaggregation when mixed with water should be given important consideration for use in limestone scrubbing systems at power plants near lake marl deposits. The soda and the grain size of a carbonate material, as well as the pore-volume distribution and surface area properties, are useful guides to the SO2 reactivity index of the material. (Author conclusions modified)

48198 **APTIC NO. 69968**

Hecht, Thomas A., Mei-Kao Liu, and David C. Whitney

MATHEMATICAL SIMULATION OF SMOG CHAMBER PHOTOCHEMICAL EXPERIMENTS (FINAL REPORT). *Systems Applications, Inc., San Rafael, Calif., Environmental Protection Agency Contract 68-02-0580, ROAP 21ADC, Task 23, Program Element 1A1008, Rept. EPA-650/4-74-040, R74-9, 192p., Nov. 1974. 53 refs.*

NTIS: PB 238 094/AS

A general kinetic mechanism for mathematically simulating photochemical smog formation was investigated. Several rate constant values were updated, and simulations of several n-butane/nitrogen oxides, propylene/NOx, and n-butane/propylene/NOx smog chamber experiments were repeated. The predictions made varied in their agreement with experimental observations, though they tended to be best at high ratios of initial hydrocarbons to NOx. The kinetic mechanism also reproduced reasonably well the behavior of a complex mixture of paraffins and NOx as well as a mixture of six olefins and NOx. A sensitivity analysis of the mechanism was performed, and the results were combined with uncertainty estimates of the rate constants to quantify the importance of determining individual rate constants with greater accuracy. The validity of the steady-state approximation in simulating smog chamber experiments and some techniques for mathematically combining a number of similar organic species into general groupings were also considered. Experimental data from a University of California evacuable smog chamber will be used to test the kinetic mechanism further. (Author abstract modified)

48199 **APTIC NO. 66488**

Henley, David C.

AN ANALYSIS OF RANDOM FLUCTUATIONS OF ATMOSPHERIC DUST CONCENTRATIONS. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Task ITO61102B53A-18. Rept. ECOM-5530, 20p., Jan. 1974. 3 refs.*

NTIS, DDC: AD 773824

A modified structure function analysis is developed for and applied to time series data on the number concentration of atmospheric dust particles. Preliminary indications are that this application is a useful method of analysis for particle concentration fluctuations, though the data should be submitted to the whole spectrum of time series methods in the interest of completeness. (Author summary modified)

48200 **APTIC NO. 69842**

Igarashi, Novuo and Masayuki Suzuki

THE EFFECT OF HC AND NOX CONCENTRATION ON PHOTOCHEMICAL REACTIONS. *(Kokagaku hanno ni oyobosu THC, NOX nodo no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):157, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 10.)*

The photochemical ozone formation is studied in relation to the concentration of propylene and nitric oxide in a smog chamber. At a constant NO concentration nn the reaction chamber, the ozone formation increased with increased propylene concentration; in the initial chamber, however, a higher propylene concentration resulted in the loss of formed ozone. At higher propylene concentration, it took more time for maximum ozone concentration to be attained. At a constant propylene concentration, the ozone formation increased with increased NO concentration. At a constant ratio between propylene and NO concentrations, the ozone formation increased with increased propylene and NO concentrations.

48201 **APTIC NO. 69864**

Kasahara, Mikio and Kanji Takahashi

AEROSOL FORMATION FROM PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE (III). *(SO2 no kokagakuteki sanka ni yoru earozoru seisei (3)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):169, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 22.)*

A qualitative investigation of the photochemical formation of sulfuric acid aerosol dependent upon parameters such as atmospheric humidity, sulfur dioxide concentraton, particle size, and irradiation time was carried out. The relationship between the time required to form a maximum number of particles per volume, T, and the rate to form largest particle size, F, is that T equals 4600 times F to the 0.75th power. This relation will predict the sulfuric acid mist formation.

48202 **APTIC NO. 65745**

Kato, Kozo, Chikatoshi Kurata, Kenji Mori, and Kenichi Fujii

FORMATION OF FUEL NITRIC OXIDE AND ITS ATTENUATION METHODS. (PART III). *(Fuel NO no seisei to sono teigenho ni tsuite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Kansai, p. 67-70, March 1974. 9 refs. (Presented at the Japan Society of Mechanical Engineers, Kansai Branch Meeting, 49th, Higashiosaka, Japan, March 19-20, 1974, Paper 3410.)*

The effect of various factors (amount of fuel nitrogen, air ratio, and combustion gas temperature) on the conversion rate of fuel nitrogen to nitric oxide was investigated using premixed fuels prepared by adding a small amount of ammonia or NO to methane. The experimental procedures and the comparative evaluation of the result obtained with the theoretical calculation values are given. The fuel NO is formed mostly in or in the vicinity of flames, and the formation and decomposition in the after flow is negligible. The amount of NO formed reaches to the saturation point as the amount of fuel NO increases, and the higher the excess fuel ratio, the lower the saturation point. From the conversion rate obtained at a certain fuel N percentage, the conversion rate at any given fuel N percentage can be obtained by the theoretical calculation. The conversion rate approaches 100% with the increase in air ratio, decrease in the amount of fuel N, and the increase in combustion gas temperature. In the case of adding a small amount of NO to CH4, the decomposition of NO is considerable at excess fuel ratio, and the amount increases with the reduction in temperature.

48203 **APTIC NO. 69856**

Kato, Tatsuo, Yoshimichi Hanai, and Shinichi Yoshida

SURVEY RESEARCH OF CAUSE OF PHOTOCHEMICAL SMOG (NO. 7). *(Kokagaku sumogu genin no chosa kenkyu, dai 7-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):165, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974. Paper 18.)*

The contribution of saturated, unsaturated, and aromatic hydrocarbons combined with nitric oxide in the formation of photochemical smog is studied. A pyrex glass was filled with NO in each hydrocarbon, and then irradiated with an ultraviolet light for several hr. The reaction products were analyzed by gas chromatography-mass spectrogrometry combination. The hydrocarbons studied are ethane, propane, n-butane, n-pentane, 2-methyl-pentane n-hexane, ethylene, acetylene, propylene, and several aromatic hydrocarbons. For the saturated hydrocarbon experiments, the reaction products found were generally categorized as acetone, methyl nitrate, ethyl nitrate, acetyl nitrate, propyl nitrate,and methyl ethyl ketone. The contribution of saturated hydrocarbons to photochemical smog is unexpectedly large; for example, the contribution in forming methyl nitrate from saturated, unsaturated, and aromatic hydrocarbons was 1:5:5, respectively. It was even greater in cases of ethyl nitrate and acetyl nitrate formations.

48204 **APTIC NO. 69841**

Kitada, Toshihiro and Masakazu Hiraoka

A NEW APPROACH TO THE COMPOSITION OF A PHOTOCHEMICAL SMOG MODEL. *(Kokagaku hanno model kosei e no hitotsu no kokoromi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):159, Nov. 1974. 2 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 12.)*

A process of photochemical reactions is proposed based on possible reaction mechanisms. Both the photochemical reaction models Hecht and Eschenroeden somehow have deviated from what has been observed in the atmosphere. By considering the basic possible chemical reactions of nitrogen oxides, hydrocarbons, and air, a new model for photochemical smog is proposed. The model is advantageous over two previous models because it is less sensitive to hydrocarbon concentrations.

48205 **APTIC NO. 70244**

Koglin, Bernd, Kurt Leschonski, and Wulf Alex

PARTICLE SIZE ANALYSIS. *(Teilchengroessenanalyse). Text in German. Chem.-Ing.-Tech., 46(23):984-987, 1974. 33 refs.*

Surface measurements of particles are discussed. After a definition of the surface the systematics of surface measurements are reviewed. The photometric surface measurement method of continuous flow methods for the measurement of the specific surfaces are described in detail.

48206 **APTIC NO. 70184**

Kostyshin, M. T. and Y. V. Mikhaylovskaya

QUANTUM YIELD FROM PHOTOLYSIS IN PBBR2 LAYERS. *(Kvantovyy vykhod fotoliza sloyev PbBr2). Text in Russian. Ukr. Fiz. Zh., 19(3):507-509, March 1974. 9 refs.*

The quantum yield during photolysis at 275 and 325 nanom in lead bromide layers was studied. Colloidal lead was identified as one of the photolysis products of lead halogenides, including PbBr2. The quantum yield of the photolysis was calculated to be 0.071 lead atoms per absorbed photon at 325 nanom, and 0.067 lead atoms per absorbed photon at 275 nanom. The findings indicate that the quantum yields of PbBr2 layers in the absorption boundary region and in the interzonal transition zone are nearly equal.

48207 **APTIC NO. 69845**

Kozaru, Kazuo, Toyoaki Aoki, Yasuaki Maeda, and Makoto Munemori

THE ROLE OF HYDROCARBONS IN NO2 PHOTODECOMPOSITION REACTIONS. *(NO2 no kobunkai hanno ni okeru tanka suiso no yakuwari). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 650, 1974. 1 ref. (Presented at the Japan Chemical Society Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q12.)*

Photodecomposition of nitrogen dioxide under black light (360 nm) was conducted in the presence of various hydrocarbons (100 ppm in a total reaction volume of 11.6 l). The presence of hydrocarbons decreased the decomposition rate of NO2. Effects of C2, C3, C4 hydrocarbons were investigated. Unsaturated hydrocarbons had more effect than saturated hydrocarbons. The presence of oxygen also suppressed the rate of NO2 decrease. When propylene and oxygen were jointly present, the suppressive effect was even more pronounced. The postulated mechanism for NO2 photodecomposition is that: Light excites NO2; the excited NO2 decomposes to nitric oxide and oxygen atom; the presence of M (HC, O2, N2) can result in collision between NO2 (excited) and M to form NO2 (unexcited) and M. However, collision of NO2 (excited) and HC can also form various products. Consequently, as HC concentration is increased further, the rate of NO2 decomposition is increased. Graphs are included.

48208 **APTIC NO. 69835**

Maeda, Yasuaki and Shin Munemori

PHOTOCHEMICAL REACTIONS OF ALDEHYDES. *(Arudehido rui no ko-kagaku hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):150, Nov. 1974. 2 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 3.)*

The role of aldehydes in nitric oxide oxidation and nitrogen dioxide photochemical decomposition is studied. Nitrogen dioxide was determined using the Saltzman method which was also used in determining nitric oxide after its oxidation to nitrogen dioxide by potassium permanganate solution. Aldehydes were quantitated gas chromatographically after catalytic reduction. Speedy photochemical oxidation of nitric oxide to nitrogen dioxide was found in the presence of aldehydes. The stimulation of the reaction was the greatest in acrolein, followed by formaldehyde, acetaldehyde, and benzaldehyde, respectively. On the other hand, slow photochemical NO2 decomposition occurred in the presence of aldehydes (acrolein, formaldehyde, acetaldehyde, and benzaldehyde, respectively). Acrolein, formaldehyde, and acetaldehyde did not stimulate the photochemical NO2 decomposition to NO; therefore, the reaction of NO2 with aldehydes is most likely.

48209 **APTIC NO. 69969**

Mazumder, M. K., B. D. Hoyle, and K. J. Kirsch

FLUID DYNAMIC STUDIES ON SCATTERING AEROSOL AND ITS GENERATION FOR APPLICATION AS TRACER PARTICLES IN SUPERSONIC FLOW MEASUREMENTS UTILIZING LASER DOPPLER VELOCIMETER (TECHNICAL PROGRESS REPORT). *Arkansas Univ., Little Rock, Dept. of Electronics and Instrumentation, National Aeronautics and Space Administration Research NGL-04-001-007, 52p., April 22, 1974. 17 refs.*

NTIS: N74-26796

The particle-fluid interactions of scattering aerosols were studied using monodisperse aerosols of different particle sizes for the application of laser doppler velocimeters in subsonic turbulence measurements. Particle response was measured by subjecting the particles to an acoustically excited oscillatory fluid velocity field and by comparing the ratio of particle velocity amplitude to the fluid velocity amplitude as a function of particle size and the frequency of oscillation. Particle velocity was measured by using a differential laser doppler velocimeter. An aspirator type atomizer was used to generate aerosols from a dilute suspension of monodisperse polystyrene latex particles. A Rapaport-Weinstock generator was used to generate aerosols of dioctyl phthalate (DOP). The test aerosols were fairly monodisperse with a mean diameter that could be controlled over the size range from 0.1 to 1.0 micron. Experimental results on the generation of a fairly monodisperse aerosol of solid particles and liquid droplets and on the aerosol response in the frequency range 100 Hz to 100 kHz are presented. A unit density spherical scatterer of 0.3-micron diameter would be an optimum choice as tracer particles for subsonic turbulence seeding of inert gases at ambient temperature are discussed, and experimental data are presented. (Author summary modified)

48210 **APTIC NO. 70238**

Mirzabekyan, G. Z.

THE EFFECT OF TURBULENCE ON THE ELECTROSTATIC PRECIPITATION OF AEROSOL PARTICLES. *(Vliyaniye turbulentnosti potoka na elektroosazhdeniye chastits aerozolya). Text in Russian. Elektrichestvo, no. 6:25-30, 1974. 11 refs.*

A mathematical study of the effect of turbulence on the electrostatic precipitation of aerosol particles is presented. The process of aerosol particle sedimentation from turbulent flow in the field of external forces was essentially determined by dimensionless parameter characterizing the relative role played by oriented and turbulent motion, and also by the nature of the changes of the external force. When assuming uniform motion of the aerosol particles over the cross section of the canal, the error involved in the determination of the precipitation efficiency is considerably smaller in the case of solenoidal motion, i.e., in the case of precipitation in a corona discharge field. For precipitation in a corona discharge field between coaxial cylinders, uniform motion of the particles can be assumed when the value of the dimensionless parameter is not greater than 5. For values of this parameter comprised between 5 and 10, assumption of a constant value of the coefficient of non-uniformity leads to considerable error in the calculation of the sedimentation efficiency.

48211 **APTIC NO. 69925**

Moreau, Richard Alan

NITRIC OXIDE FORMATION IN A HYDROCARBON-AIR COMBUSTION SYSTEM. *Illinois Univ., Urbana, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-12,124, 1974, 154p. 75 refs.*

The formation of nitric oxide in a hydrocarbon-air combustion system was studied along with the time history of each species in the system using a kinetic model. Initial formation rates of NO were rapid, with most changes occurring within 1 millisecond. Final concentrations were near 8000 ppm by volume and were reached in 1.5-2.0 milliseconds. The final values of nitric oxide were dependent only on fuel-air ratio and not on the compression ratio of the combustion system used (a rapid or adiabatic compression machine). The formation of nitric oxide was not an equilibrium process but was rate-limited. The NO production was limited by fuel-lean combustion, with maximum NO formation being at or near an equivalence ratio of 0.8 for the system. Measured heat-transfer coefficients were similar to those measured in actual operating engine cycles. The heat-transfer process controlling NO kinetics can be modeled by a constant overall heat-transfer coefficient model.

48212 **APTIC NO. 69858**

Nakano, Kinji, Hisashi Yokota, Masataka Sofuku, Atsuko Kobayashi, Sadao Omichi, and Motoharu Nakanishi

PHOTOCHEMICAL REACTION OF HYDROCARBONS SHOWN BY THE BAG TECHNIQUE. *(Baggu o mochiita tankasuiso no kokagaku hannosei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):163, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 16.)*

Photochemical reactivities of various hydrocarbons are compared. By putting each hydrocarbon into a fluorinated vinyl bag together with nitric oxide and research grade air, the bag was irradiated externally by artificial ultraviolet light. The photochemical reaction products are analyzed for total nitrogen oxides, ozone, and peroxyacetyl nitrates; the rates of production are also obtained for each experiment. The concentration ranges studied are 2 ppm of hydrocarbon and 1 ppm of nitric oxide. The humidity inside the bag was kept 47% at 27 C.

48213 **APTIC NO. 66932**

Nojima, Kazuhiro, Katsuhisa Fukaya, Syozo Fukui, and Saburo Kanno

THE FORMATION OF GLYOXALS BY THE PHOTOCHEMICAL REACTION OF AROMATIC HYDROCARBONS IN THE PRESENCE OF NITROGEN MONOXIDE. *Chemosphere, 3(5):247-252, Oct. 1974. 3 refs.*

Results are presented from irradiated chamber experiments involving the photochemical reaction of aromatic hydrocarbons in the presence of nitric oxide. Reactions involving benzene, toluene, orotho-xylene, meta-xylene, and para-xylene resulted in the formation of glyoxal in each instance. Methylglyoxal was produced from all of the aromatics except benzene, and dimethylglyoxal was produced from ortho-xylene. The higher the concentration of nitric oxide, the greater the amounts of glyoxals produced. The formation of the glyoxals from the aromatic hydrocarbons clearly indicated cleavage of the benzene ring during the photochemical reaction. Residual aromatic hydrocarbon concentration after the photochemical reaction was lowest with xylenes and highest with benzene, suggesting that xylenes were more photochemically reactive than toluene which in turn was more reactive than benzene. A new method for the determination of glyoxal, methylglyoxal, and dimethylglyoxal was also utilized based on the fact that the glyoxals react with 4-chloro-o-phenylenediamine to give 6-chloroquinoxaline derivatives which can be detected by electron capture gas chromatography.

48214 **APTIC NO. 69834**

Okita, Toshikazu, Katsuo Shibuya, and Yoshikazu Kusuya

THE MEASUREMENT OF UV INTENSITY BY ONBA METHODS WITH A QUARTZ BALL. *(Sekiei kyu ni ireta onva ni yoru shigaisen sokuteiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):151, Nov. 1974, 1 ref. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 4.)*

A standaridization of measurement for ultraviolet light was attemped. The method is intended to measure the light intensity per irradiated volume, rather than per area. A 40-millliter quartz ball filled with ortho-nitrobenzaldehyde (ONBA) in water- methyl alcohol (9 to 1) solution was irradiated by a standard UV light for a certain period, and the solution pHs were measured against the irradiated time. The plots are then correlated with the solution pHs using sunlight. A correction was made for the spectral distribution of two lights for the light absorption by ONBA. A similar experiment was made for a quartz ball filled with nitrogen dioxide for a standard method of UV light intensity measurement.

48215 **APTIC NO. 69721**

Ozawa, Atsuji, Mikio Ueda, Shigenori Suzuki, and Takanobu Shiosaki

METHOD AND DEVICE FOR THE RECOVERY OF LOW MELTING POINT METAL STEAM FROM THERMAL CRACKING PRODUCTS. *(Netsu bunkai seiseibutsu yori teiyuten kinzoku joki o kaishu suru hoho oyobi sono sochi). Text in Japanese. (Mitsui Shipbuilding Co. (Japan)) Japan. Pat. Sho 49-26809. 3p., July 12, 1974. (Appl. Dec. 24, 1970, 2 claims).*

An invention for the recovery of thermal catalyst for hydrocarbon cracking is described. The device has the following characteristics: a collector having a smaller lower chamber and a larger upper chamber; three inlet tubes which introduce thermal cracking products from the cracking reactor to the lower, middle, and upper sections of the lower chamber; two cooling tubes in the lower chamber; multi-layer collision plates alternately arranged in the upper chamber; and an overflow tube which recycles the thermal cracking products to the reactor. The lower chamber was filled with the thermal cracking products containing low melting point metal catalyst. The temperature of the collector is controlled to give the lowest vapor pressure of the metal catalyst. Metal mist flow rate is greatly reduced by the increase of diameter in the upper chamber, and is condensed by hitting the collision plates. The condensed metal is removed from the bottom of the lower chamber while the thermal cracking products of hydrocarbons are collected from the top of upper chamber.

48216 **APTIC NO. 69994**

Packer, Eugene S.

FLUORESCENCE DYNAMICS OF NO2. *Case Western Reserve Univ., Cleveland, Ohio, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-2556, 1974, 95p. 26 refs.*

The fluorescence dynamics of nitrogen dioxide were examined by illuminating NO2 with 436 nm radiation from Xenon arc, leading to the excitation of one of the oxide s low lying nondissociative electronic states (probably 2B2 possibly mixed with 2B1). The fluorescence intensity at the steady state was monitored as a function of pressure and fluorescent wavelength over the wavelength range of 500 to 1000 nm. Stern-Volmer type quenching constants were derived and appeared to decrease as the difference between the frequency of the exciting and fluorescent radiation increased. Nitrogen dioxide did not appear to obey simple Stern-Volmer kinetics but rather more closely followed a collisional vibrational deactivation mechanism with vibrational quenching of the excited state occurring at about the gas kinetic collision rate. Pure electronic quenching occurred at a rate of 1% or less of the rate of vibrational relaxation. (Author abstract modified)

48217 **APTIC NO. 65806**

Panduranga, V. and Jharna Ganguly

CONVERGENCE OF A SET OF MUTIVARIABLE FUNCTIONS RELATING TO COMBUSTION PROBLEMS. *Indian J. Technol. (India), 12(1):20-22, Jan. 1974. 5 refs.*

In dealing with a computerized technique for the solution of combustion problems relating mainly to the calculation of equilibrium compositions, the conditions for the convergence of a set of multivariable functions are described. The method of search and bisection is used for the rapid convergence of one of the variables. The method is very effective, and the results are not affected by the initial value and the increment. To ensure general applicability of the method, the condition for the convergence of such complicated systems of equilibrium was worked out from fundamentals taking the case of a hydrogen-air reaction. The analogy is extended to cover a set of multivariable functions to make the solution applicable to a larger variety of problems. (Author abstract)

48218 **APTIC NO. 65675**

Rhodes, R. P., P. T. Harsha, and C. E. Peters

TURBULENT KINETIC ENERGY ANALYSES OF HYDROGEN-AIR DIFFUSION FLAMES. *Acta Astronaut., 1(3-4):443-470, March-April 1974. 17 refs.*

A series of predictive models is presented for turbulent shear flows with simultaneous chemical reactions. The fluid-mechanical framework, which is based on solution of the turbulent kinetic energy equation, is identical to that which has been used to successfully predict nonreactive flows. Both finite-difference and integral solution techniques are presented. The density field is computed either by ignoring the influence of the turbulent fluctuations on the time-averaged density, or by use of a probabilistic model for evaluating the influence of turbulent fluctuations on the chemical reactions and on the time-averaged density. The predictions are compared with detailed experiments on a hydrogen-air diffusion flame. The overall flowfield is well predicted, which indicates that the fluid-mechanical framework can account for the large heat release in the flow. In general, the models which take the turbulent fluctuations into account provide better predictions of the overall flowfield. In addition, these models predict such observed features as a wide flame zone, even for near equilibrium chemistry, and significant production of nitirc oxide in fuel-rich regions of the flow. (Author abstract)

48219 **APTIC NO. 69901**

Schwartz, Warren, E., Peter W. Jones, Charles J. Riggle, and David F. Miller

CHEMICAL CHARACTERIZATION OF MODEL AEROSOLS (FINAL REPORT). *Battelle Memorial Inst., Ohio, Columbus Labs., Environmental Protection Agency Grant 801174, ROAP 21AKB-08, Program Element 1AA008, Rept. EPA-650/3-74-011, 141p., Aug. 1974. 62 refs.*

NTIS: PB 238 557/AS

Model aerosols were generated from individual hydrocarbon precursors and nitrogen oxides under simulated atmospheric conditions in a 17.3 cu m environmental chamber. Hydrocarbon precursors employed were toluene, alpha-pinene, and cyclohexene. Aerosols were collected on glass-fiber filters, and organic matter was obtained by solvent extraction. Organic reaction products were fractionated into acid, neutral, and basic components and analyzed in detail by techniques including gas chromatography and gas chromatography combined with mass spectrometry. Techniques for selective derivatization of aerosol products were also evaluated. A variety of polyfunctional reaction products were identified, including alcohols, aldehydes, ketones, carboxylic acids, and phenols. Tentative identification of nitrogen-containing products was also accomplished, including nitrate esters and aromatic nitro compounds.

48220 **APTIC NO. 69848**

Shige, Yoshimitsu, Kunio Hasegawa, and Masamichi Ozaki

AIR POLLUTION CONTROL SYSTEM. *(Taiki osen kanshi shisutemu: Hyogo-ken ni okeru taiki osen kanshi shisutemu). Text in Japanese. Oyo Buturi (J. Japan Soc. Appl. Phys.), 43(8):831-839, Aug. 1974. 2 refs.*

A description is given of how to set up a working air pollution control system by means of computer. The system used since 1973 in Hyogo Prefecture is taken as an example. Necessary requirements for any system include reliability of data storage, expansibility of program input, operational ease, instant response to inquiry, and economy within the limits of desired reliability. Tables, diagrams, flow charts are included.

48221 **APTIC NO. 69838**

Shimada, Isamu, Shigeru, Yanagiharo, Takeshi Ishii, Etsukazu Shinoyama, Keizo Saito, and Fumitake Chisaka

PHOTOCHEMICAL REACTIVITIES OF HYDROCARBONS. *(Kakushu tankasuiso no kokagaku hannosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):154, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 7.)*

Photochemical reactivities of major hydrocarbons are clarified experimentally using a large smog chamber. Internal olefins were extremely reactive, and aromatic compounds with an increased number of alkyls attached to them became more reactive. With an increased number of carbons, alcohol compounds were more reactive. The reactivities of esters, ketones, and halogen compounds, were generally small; however, trichloroethylene showed a relatively high reactivity.

48222 **APTIC NO. 69377**

Shimazaki, Tatsuo and Toshihiro Ogawa

ON THE THEORETICAL MODEL OF VERTICAL DISTRIBUTIONS OF MINOR NEUTRAL CONSTITUENTS CONCENTRATIONS IN THE STRATOSPHERE. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA TM ERL OD-20, 37p., May 1974. 155 refs.*

NTIS: COM-7411327

A technique for modeling the vertical distributions of various neutral minor constituents in the stratosphere is discussed, and model calculations are used to qualitatively describe the effect of water vapor and nitrogen oxides emissions from supersonic transport vehicles on the ozonosphere. Chain or serial reactions peculiar to compounds containing oxygen, nitrogen, and hydrogen are considered along with interactions among different systems. A steady state solution is first calculated for the solar zenith angle fixed at the daytime average, and the effects of NOx and hydrogen oxides on ozone density are examined using different rate coefficients for reactions of O3 with HOx. The model calculations indicate that HOx chemistry is as important as NOx chemistry in reducing O3 below about 20 km, although NOx chemistry is exclusively important above that height until about 40 km. Hydrogen oxide chemistry is dominant in the upper stratosphere, while nitrogen trioxide chemistry is most important in the lowest region of the stratosphere. The model is compared to other theoretical models, with explanations proposed for major discrepancies. A diurnal variation model is constructed from the steady state solution obtained, and limitations of the one dimensional model for representing realistic stratospheric minor constituent distributions are cited.

48223 **APTIC NO. 69408**

Slinn, W. G. N.

ANALYTICAL INVESTIGATIONS OF INERTIAL DEPOSITION OF SMALL AEROSOL PARTICLES FROM LAMINAR FLOWS ONTO LARGE OBSTACLES. PART B - LARGE STOKES NUMBER SOLUTION BY THE METHOD OF MATCHED ASYMPTOTIC EXPANSION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3 Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 188-199, April 1974. 52 refs.*

NTIS: BNWL-1850 PT3

The method of matched asymptotic expansions is applied to obtain the first order correction to the collection efficiency at large Stokes numbers. Analytical continuation of the solution to a result valid for all Stokes numbers is discussed. The most productive procedure is to gain information about the small Stokes number limit. (Author abstract modified)

48224 **APTIC NO. 69479**

Slinn, W. G. N.

ANALYTICAL INVESTIGATIONS OF INERTIAL DEPOSITION OF SMALL AEROSOL PARTICLES FROM LAMINAR FLOWS ONTO LARGE OBSTACLES. PART A - GENERAL FORMULATION. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3: Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, Environmental and Earth Sciences Rept. UC-11, p. 179-187, April 1974.*

NTIS: BNWL-1850 PT3

The inertial deposition of small aerosol particles from laminar flows onto large obstacles was investigated. A continuum model was developed which replaces Newton s second law by a continuity equation and pseudomomentum equation. Some features of the general solution were determined. Regular perturbation methods fail both at large and small Stokes numbers. Data can be used to study rain scavenging. (Author abstract modified)

48225 **APTIC NO. 69541**

Slinn, W. G. N.

AN ANLYTICAL SEARCH FOR THE STOCHASTIC-DOMINATING PROCESS IN THE DRIFT-DEPOSITION PROBLEM. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3: Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1): 1830, Environmental and Earth Sciences Rept. UC-11, p. 254-266, April 1974.*

NTIS: BNWL-1850 PT3

The random processes in the drift-deposition problem are examined separately to see if any one dominates the statistical properties of the outcome. The three prime candidates are assumed to be drop size distribution, distribution of breakaway points, and turbulent diffusion. The drop size distribution has dominant influence on the deposition of the large size (drift or carry-over) drops. Turbulence has a comparable influence on the deposition of the small drops for downwind distances of the order of 10 tower heights and then dominates for large downwind distances, provided the atmosphere is not stable. Uncertainties in details of how the drops break free from the plume s updraft preclude an accurate evaluation of this effect and seriously limit the accuracy of any drift-deposition prediction. This data is valuable for scavenging studies. (Author abstract modified)

48226 **APTIC NO. 69963**

Stone, J. P., F. W. Williams, and H. W. Carhart

THE ROLE OF SOOT IN TRANSPORT OF HYDROGEN CHLORIDE FROM FIRES (INTERIM REPORT). *Naval Research Lab., Washington, D. C., Chemistry Div., Naval Ship Systems Command NRL Problem 61C08-36, SF54-543-706-14753-03, NRL Rept. 7723, 16p., April 23, 1974. 36 refs.*

NTIS, DDC: AD 779258

The combustion properties of polymeric materials were studied to determine toxic and fire hazards on ships. To understand the nature and amounts of products from confined-space fires and the effect combustion conditions have on the products, a soot aerosol study was conducted. The study tested necessary conditions of the hypothesis that in confined-space fires where chlorinated plastics burn or pyrolyze to give off hydrogen chloride, soot particles adsorb and carry the gas. The partition of HCl between the vapor phase and soot particles was measured during burning of polyvinyl chloride (PVC) with polyethylene (PE). In addition, soot particles were characterized as to surface area, shape, size, crystallinity, and apparent density. As predicted by the hypothesis, soot transported HCl, but less HCl was carried by the soot than was expected. A nitrogen gas purge of the soot easily removed 19 milligrams of HCl/g of soot; 23 milligrams of chlorine, tightly bound, remained. The spherical, amorphous soot particles formed in the combustion varied in size from 0.3 to 0.11 micron. Simple agglomeration theory suggests that the clusters grow rapidly but remain below 2.5 micron in diameter for an hour. When exposed to this dense smoke (1.57 g/cu m) for 1 hr, it is estimated that a man would retain 36 milligrams of easily removed HCl in his lungs. The importance of water in transport of HCl by soot is implied. Implications for future work are discussed. (Author abstract modified)

48227 **APTIC NO. 69836**

Suzuki, Shin and Kazuo Matsumoto

STUDIES ON THE REACTION BETWEEN ATOMIC OXYGEN OR NITROGEN AND SATURATED HYDROCARBONS. *(Sanso genshi aruiwa chisso genshi to parafin-kei tanka-suiso tono hanno ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):149, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 1.)*

Reaction products for atomic oxygen or atomic nitrogen with methane, ethane, and propane reactions wree analyzed by gas chromatography, mass spectrometry, and colorimetry. A microwave discharge tube was used to produce atomic oxygen or nitrogen for the reactions, and the reaction products were trapped in liquid nitrogen or dry ice-acetone for analysis. Major products of the reaction between atomic oxygen and low molecular weight hydrocarbons were identified as formaldehyde, methyl alcohol, water, and carbon dioxide, while atomic nitrogen produced hydrogen cyanide and ammonia.

48228 **APTIC NO. 69837**

Suzuki, S. N. Horiuchi, H. Takagi, and V. Ando

PHOTOCHEMICAL REACTIONS BETWEEN SULFUR DIOXIDE AND ORGANIC COMPOUNDS (V). *(Aryusangasu to yuki kagobutsu tono ko-kagaku hanno (V)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):140, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 2.)*

Photochemical acetaldehyde formation was compared in reactions between sulfur dioxide and cis-2-butene with and without oxygen under mercury light. Acetaldehyde was first trapped in the reaction with 2,4-dinitrophenylhydrazine, then the product was dissolved into carbon tetrachloride for gas chromatographic anlysis. Oxygen presence apparently increased the reaction rate in forming acetaldehyde.

48229 **APTIC NO. 69308**

Suzuki, Yoshinobu, Shusaku Saito, and Eiji Miyaji

ADSORPTION OF VARIOUS GASES IN THE AIR BY ADSORBENTS. (REPORT NO. 1): ADSORPTION OF SO2. *(Kyuchakuzai ni yoru kukichu no kakushu gasu no kyuchaku. (Dai-1-po): SO2 no kyuchaku). Text in Japanese. Shimizu Kensetsu Kenkyusho-ho (Rep. Res. Lab., Shimizu Constr. Co., Ltd.), no. 22:67-77, April 1974. 5 refs.*

To investigate the absorbability and adsorption mechanism of sulfur dioxide by activated charcoal, silica gel, and metallic oxide adsorbents, the adsorption isotherms were obtained by the static method, and the type of adsorption isotherm curve, heat of adsorption, rate of adsorption and effect of water were evaluated. The specific surface area of adsorbents measured by The B.E.T. method were 860 sq m/g for activated charcoal, 150 sq m/g for metallic oxides, and 600 sq m/g for silica gel. The secondary electron image of adsorbent surface by X-ray micro-analyzer showed pores on activated charcoal, however, no pores were observed in the case of metallic oxide adsorbent. The equilibrium adsorption quantities obtained at equilibrium pressure of 1-50 mm Hg and 20 C were in good agreement with the Freundlich equation. The adsorption quantity of K (activated charcoal) was higher than that of D (metallic oxide). The differential heat of adsorption was 6.4-8.0 kcal/mol for K and 5.7-6.5 kcal/mol for D. The rate of adsorption of D was higher than that of K. The effect of H2O on the adsorption of SO2 was almost nil in the case of K; however, a slight effect was observed in the case of D at 10 mm Hg. The adsorbent life calculated from the equilibrium adsorption, break point curve, and experimental result was over 3000 hr in the case of D.

48230 **APTIC NO. 69330**

Timoshenko, V. I.

CALCULATION OF THE DIFFUSIVITY OF AEROSOL PARTICLES IN A SOUND FIELD. *Sov. Phys. Acoust. (English translation from Russian of: Akust. Zh.), 19(5):504-505, March-April 1974. 4 refs.*

For a description of many mass-transfer processes in high-intensity sound fields it is required to know the particle diffusivity associated with vibrational motion of the medium. The determination of the diffusivity of aerosol particles in a sound field is of fundamental significance in formulating the equations for the kinetic process of acoustic coagulation. Equations are presented for calculating the diffusivity of aerosol particles in a sound field. The variation of the mobility of all particles in a sound field causes a sizable deviation (as much as twofold) of the diffusivity from the Einstein value. In the calculations allowance was not made for the temperature variation in the sound field, because it was shown that the influence of this factor on the diffusivity is very slight; the variation amounts to about 0.1% of the value of the Einstein value of diffusivity.

48231 **APTIC NO. 69317**

Warshay, Marvin and Christopher L. Caenepeel

CATALYTIC OXIDATION OF TRACE LEVELS OF METHANE IN OXYGEN IN A TUBULAR REACTOR. *National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio, NASA-TN-D-7687, Work Unit 502-25, Rept. E-7595, 19p., June 1974. 6 refs.*

NTIS: N-74-25649

An experimental investigation of catalytic oxidation of trace levels of methane in oxygen was conducted in a tubular reactor. Two noble metal solid catalysts were explored: a 1% platinum on gamma alumina and a 0.5% rhodium on gamma alumina. For each catalyst, the activity was determined as a function of temperature, pressure, space velocity, and methane concentration. The rhodium catalyst was considerably more active than the platinum catalyst. For each catalyst, mass transfer had a pronounced effect upon activity at low space velocity. The lowering of the space velocity caused the reaction rate constant to drop over two orders of magnitude. The highest temperatures reached were 535 K with the Rh catalyst and 741 K with the Pt catalyst. At these temperatures approximately 90% methane conversion to carbon dioxide occurred in each case. Data on the catalytic oxidation of trace levels of hydrocarbons such as methane in oxygen can be used in removing trace HC impurities contained in the oxygen feed in hydrogen-oxygen alkaline fuel cell and in studies of methods of monitoring trace HC in air. (Author abstract modified)

48232 **APTIC NO. 65515**

Wood, William P., A. W. Castleman, Jr., and I. N. Tang

MECHANISMS OF AEROSOL FORMATION FROM SO2. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. 17 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-153.)*

The mechanisms of important reactions leading to aerosol formation involving sulfur dioxide and mixtures with nitrogen dioxide were investigated. The rapid generation of a high number density aerosol was effected upon exposing 1 ppm of SO2 to ionizing radiation in the presence of moisture. Subsequent addition of ammonia lead to further chemical conversion, the product was identified as ammonium sulfate. Mass spectrometric studies of the gas phase showed the expected reaction sequence leading to the formation of H3O(+) hydrates and the hydroxyl radical. Additional experiments with an ion trap and appropriate free radical scavengers proved that aerosol formation did not involve an ion-molecule switching reaction; but rather, the reaction of OH with SO2 was an important initiating step. The kinetics of the oxidation and subsequent hydration reaction leading to aerosol formation are discussed. Aerosol formation involving NO2, SO2, and water vapor was investigated and showed in the absence of organic impurities, no dark reaction leading to aerosol formation for concentrations up to 1000 ppm of the reacting gases. Upon exposure to light, aerosol production occurred. At low reactant concentrations, the kinetics of particle formation depend directly on SO2 concentration. Above a certain minimum level, particle formation is independent of NO2. (Author abstract modified)

48233 **APTIC NO. 68442**

Japan Society of Public Health

REPORT ON THE INVESTIGATION OF THE PHOTOCHEMICAL REACTIVITY OF HYDROCARBONS. *(Tanka suisorui no kokagaku hannosei chosa kenkyu hokokusho). Text in Japanese. Japan Environmental Agency, Bureau of Air Quality Contract. 190p., March 1974.*

Various organic solvents and nitrogen oxides were mixed in a smog chamber and irradiation experiments were conducted. Initially, 2 ppm of hydrocarbons and 1 ppm of nitrogen oxide were mixed and the temperature, humidity, irradiation intensity, and irradiation temperature were maintained at a given level while the concentrations of nitric oxide, nitrogen dioxide, hydrocarbons, and ozone were measured. The maximum irradiation time was 6 hr. The main gas analyzers were a chemiluminescence ozone meter, a chemiluminescence NO meter, the Saltzman type continuous colorimetry for NO2, flame ionization detector total HC meter and gas chromatography. One experimental analysis was made for each of 33 elements of HCs. Various laboratories were in charge of similar smog chamber experiments and the total results are presented in tables and graphs. The results of different labs showed some good correlations, but the results of the experiments themselves show some discrepancies which may have been caused by differences in experimental conditions.

1973

48234 **APTIC NO. 67127**

Beauchene, J. H., P. J. Bekowies, J. M. McAfee, A. M. Winer, L. Zafonte, and J. N. Pitts, Jr.

A NOVEL OF 20 KW SOLAR SIMULATOR DESIGNED FOR AIR POLLUTION RESEARCH. *American Inst. of Aeronautics and Astronautics, American Society of Testing and Materials, and Inst. Environmental Sciences, Proc. Joint AIAA-ASTM-IES Space Simul. Conf., 7th, 1973, p. 811-825. 9 refs. (Paper 66.)*

An atmospheric chamber facility for the study of photochemical air pollution at ambient pollutant concentrations was established at the Statewide Air Pollution Research Center of the University of California, Riverside. The facility consists of two environmental chambers and a 20 KW solar simulator. The properties and detailed performance characteristics of the solar simulator are described including beam intensity, spectrum, uniformity, and collimation. The simulator was designed to the special requirements of the SAPRC facility and was subsequently built and tested. (Author abstract modified)

48235 **APTIC NO. 69356**

Belen kii, V. A., V. I. Timoshenko, and T. Y. Fedoruk

CHOOSING THE OPTIMUM CONDITIONS FOR THE ACOUSTIC COAGULATION OF AEROSOLS. *Sov. Phys. Acoust. (English translation from Russian of: Akust. Zh.), 19(2):181-182, Sept.-Oct. 1973. 3 refs.*

The optimum conditions for the coagulation of aerosols in a field were investigated. Thy influence of the following factors were assessed: dust concentration, temperature of the dust gas flow, frequency and intensity of the sound field, and the sonic irradiation time. A mathematical description of thy process was derived in the form of a regression equation. The efficient operation of an electric separator at dust concentrations up to 5 g/cu m in the dust gas flow and at a temperature of 250 C requires sonic irradiation for a period of 1.5 to 2 sec with a field having an intensity of 0.2 W/sq cm.

48236 **APTIC NO. 68535**

Caretto, L. S.

MODELING POLLUTANT FORMATION IN COMBUSTION PROCESSES. *Combustion Inst., Pittsburgh, Pa., Proc. In. Symp. Combust., 14th, University Park, Pa., 1972, p. 803-817, 1973. 58 refs. (Aug. 20-25.)*

The techniques of empirical modeling of pollutant formation in various practical combustion devices are described. The elementary reactions for nitric oxide and carbon monoxide kinetics are presented. Because these basic mechanisms are well known, they have been applied to a large number of devices. The kinetics of hydrocarbons, sulfur oxides, and particulate matter are usually modeled by global rate equations. Most attention has been given to spark ignition engines, gas turbine combustors, and utility boilers. The use of direct solutions of the partial differential equations for species, mass, momentum, and energy conservation is considered. An example of the use of these equations to predict nitric oxide formation is presented, and the prospects for further applications of direct solution techniques are discussed. (Author abstract)

48237 **APTIC NO. 69344**

Crutzen, Paul J.

PHOTOCHEMICAL REACTIONS INITIATED BY AND INFLUENCING OZONE IN THE TROPHOSPHERE. *Stockholm Univ., Inst. of Meteorology, Rept. AP-13, 1973-05-24, 24p., May 1973. 54 refs.*

Theoretical arguments in favor of hydroxide concentrations larger than 10 to the 6th power/cu cm in the sunlit lower trophosphere during photochemical reactions, even if allowance is made for the possible heterogeneous aerosol removal of OH, HO2, and nitric molecules, are presented. The significant role played by OH in the atmospheric carbon, nitrogen, and possibly sulfur cycles is discussed. Low background mixing ratios of nitrogen oxide molecules (10 to the -9th power) in the unpolluted atmosphere are predicted. The oxidation of ammonia, initiated by the reaction with OH, may provide an important source of tropospheric NOx molecules. The conversion of nitrogen dioxide into HNO3 is the most important tropospheric sink for NOx molecules. The photodissociation of ozone in ultraviolet light between 300 and 330 nm, which leads to the formation of the excited O (1D) atom, drives the entire sequence of reactions treated in this study. Several chains of reactions lead to formation and destruction of ozone. Ozone is, therefore, a very active component in the tropospheric chemical system. (Author abstract)

48238 **APTIC NO. 69927**

Flagan, Richard C. and John P. Appleton

A STOCHASTIC MODEL OF TURBULENT MIXING WITH CHEMICAL REACTION: NITRIC OXIDE FORMATION IN A PLUG-FLOW BURNER. *Massachussetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., National Aeronautics and Space Administration Grant NGR 22-009-378 and Environmental Protection Agency Grant R-800-729-03-01, NASA-CR- 138628, FML Pub-73-10, 63p., Dec. 1973. 30 refs.*

NTIS: N74-26818

A stochastic model of turbulent mixing was developed for a reactor in which mixing is represented by n-body fluid particle interactions (n equals 2,3,...6). The model was used to justify the assumption (made in previous investigations of the role of turbulent mixing or burner generated thermal nitric oxide and carbon monoxide emissions) that for a simple plug flow reactor, composition nonuniformities can be described by a Gaussian distribution function in the local fuel:air equivalence ratio. Recent extensions of this stochastic model to include the combined effects of turbulent mixing and secondary air entrainment on thermal generation of nitric oxide in gas turbine combustors are discussed. Rate limited upper and lower bounds of the nitric oxide produced by thermal fixation of molecular nitrogen and oxidation of organically bound fuel nitrogen are estimated on the basis of the stochastic model for a plug flow burner; these are compared with experimental measurements obtained using a laboratory burner operated over a wide range of test conditions; good agreement is obtained. (Author abstract)

48239 **APTIC NO. 69257**

Foster, P., J. Besson, and A. Cornu

DEVELOPMENT OF AN AIR POLLUTION SIMULATOR. STUDY OF INTERACTION OCCURRING DURING IRRADIATION OF VARIOUS AIR POLLUTANTS. *(Realisation d un appareillage de simulation atmospherique. Etude de l interaction sous irradiation de divers polluants atmospheriques). Text in French. Analusis, 2(8):605-607, Sept. 1973. 5 refs.*

A simulator developed for the study of photochemical processes occurring in polluted air is described, and preliminary results of the simulation of thye photochemical reactions occurring between different pollutants under ultraviolet (UV) irradiation at a pressure close to barometric and at 25-29 C temperature are presented. The simulator is constituted by a spherical tank of 200-liter volume, equipped with the necessary pumps as well as temperature and pressure control devices. In air with 25 ppm chlorine and 100 ppm benzene, formation of monochlorobenzene and hydrochloric acid was observed after UV irradiation for 10 hr. Mixtures of 100 ppm toluene with 35 ppm chlorine and of 50 ppm toluene, 50 ppm paraxylene, and 35 ppm chlorine in air formed fog after irradiation for 4 to 5 min which disappeared upon cessation of the irradiation. Benzaldehyde, tolualdehyde, phenol, and cresol were identified as the reaction products in such mixtures after irradiation for 4 hr. After 8 hr irradiation, hydrochloric acid, benzene, benzaldehyde, phenol, 2-chlorophenol, monochlorotoluene or benzyl chloride or both, chlorocresol, cresol, tolualdehyde, monochloroxylene, and possibly terephthalic aldehyde and formyl-4-benzoic acid were found as the reaction products. The findings indicate that chlorine provokes photochemical oxidation of the benzene derivatives studied.

48240 **APTIC NO. 69811**

Gormley, Carolyn J. and Sheldon A. London

EFFECT OF BERYLLIUM ON SOIL MICROORGANISMS. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th. Annu., Fairborn, Ohio, 1973, p. 401-416. 35 refs. (Oct. 16-18, Paper 29.)*

NTIS, DDC: AD 781031

The effects of beryllium-containing rocket propellants on soil microorganisms were studied. The effects of beryllium as a soluble salt on soil microorganisms and the eventual fate of this ion in the biological food chain were assessed. The ability of 16 bacterial species to remove beryllium from growth medium was studied. To ascertain if beryllium uptake was related to cell number, a growth curve was determined and the supernatant analyzed periodically for beryllium. An experiment was also performed to determine whether soil microorganisms could substitute Be for magnesium in the growth medium. The soil microorganisms varied widely in their ability to assimilate beryllium. Beryllium can be added to the list of metal ions showing no inhibitory effect on some strains of bacteria in concentrations up to 1000 micrograms/ml. The addition of 100 micrograms/ml Be ion to the growth medium resulted in two effects on the growth of the mixed soil cultures: a delay of 20 hr before the onset of the log phase occurred in the Be cultures as opposed to the controls, and the attainment of a higher level of growth. The culture showing maximum uptake of Be was studied further to determine if Be was being assimilated by the bacteria or merely adhering to cellular material by a simple process of adsorption. These experiments suggested that Be was not adsorbed to the cells.

48241 **APTIC NO. 69453**

Griffin, J. R. and H. L. Wittek

VERSATILE SINGLE-CYLINDER DIESEL TEST ENGINE FOR LUBRICANT, EMISSIONS AND FUEL RESEARCH. *Preprint, Society of Automotive Engineers, Inc., New York, 16p., 1973. 7 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730831.)*

Laboratory development of modern diesel engine lubricants should ideally be done at the high output/speed conditions where the latest engines operate. In the late 1960 s, the only engines available to the oil industry were the Caterpillar 1Y73 and the Petter AV-1. While these were useful test tools, neither could successfully operate at the desired conditions or be successfully modified for that purpose. A joint project was established in 1969 between Chevron Research and List-Rosen-Wittek/AVL to adapt one of the AVL diesel development engines to lubricant, emission, and fuel research. The design criteria developed included modern speed/output capability, durability, low maintenance, special lubrication features, adaptability, and balancing. These requirements resulted in a completely new design. A prototype was constructed, and this engine ran in Oct. 1972. The design features are described and illustrated. The variable injection timing is of enormous help in all exhaust emissions research. The prototype engine successfully completed a 100-hour test run under 1-G conditions and several short runs under heavy load and at high speed. The engine is now being installed at an engine laboratory. (Author abstract modified)

48242 **APTIC NO. 69456**

Griffin, O. M., S. E. Ramberg, C. W. Votaw, and M. D. Kelleher

THE GENERATION OF LIQUID AEROSOLS FOR THE VISUALIZATION OF OSCILLATORY FLOWS. *Preprint, Naval Research Lab., Washington, D. C., and Naval Postgraduate School, Monterey, Calif., p. 133-139, 1973. 13 refs.*

The utilization of some means of flow visualization is frequently the first step toward a solution of the problems associated with a complex fluid dynamic phenomenon. A method of flow indicator generation is described that produces a liquid aerosol of di(2-ethylhexyl)phthalate. An aerosol so produced is nontoxic, chemically inert, and noncorrosive under normal laboratory conditions. The particle size range obtained (less than 1 micron mean diameter) is especially useful for the study of oscillatory and turbulent fluid motions. The directional light scattering properties of the aerosol were measured and compared with the scattering properties of smoke. Scattered light intensities from the aerosol were nearly twice the scattered intensities from smoke at the same flow rate. Photographs of vortex wakes behind vibrating cylinders and secondary flows in curved channels are presented as examples of the successful operation of the system. (Author abstract)

48243 **APTIC NO. 75050**

Guichard, J. C.

COMPARATIVE STUDY OF THE METHODS OF DETERMINATION OF THE GRANULOMETRY OF DUSTS SAMPLINGS (FINAL REPORT). *(Etude compararive des methodes de determination de la granulometry d un prelevement de poussieres). National Research Inst. of Applied Chemistry, IRCHA A.0108, CECA Research 652-2-/3-194, Feb. 13, 1973. 21 refs. Translated from French, 50p. (TR 145-75.)*

The determination of the granulometric distribution in particles was calculated. For most aerosols and powders there are several curves of particle distribution as a function of the diameter. The causes of the mathematical variation are explained and classified. Mathematical methods for the conversion of the distributions are presented. (Author abstract modified)

48244 **APTIC NO. 67154**

Haury, G. and S. Jordan

CATALYTIC OXIDATION OF SO2 ON AEROSOLS. *(Katalytische Oxidation von SO2 an Aerosolen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 62-65. (Oct. 17-18.)*

The catalytic oxidation of sulfur dioxide in nitrogen and oxygen mixture by manganese sulfate, iron sulfate, and sodium chloride aerosols was studied. At an SO2 concentration of 5 mg/cu m, the aerosol concentration and median particle size were about 10 mg/cu m and 1.2 micron, respectively. The rate of catalytic oxidation amounted to 10% per hour. The catalytic activity of sodium chloride aerosols was much lower than that of manganese sulfate and iron sulfate aerosols. The rates of oxidation were found to be dependent on the relative humidity. Under a definite limit, ranging from 80 to 90% depending on the type of the aerosol, the latter were solid and contained no more than 5% water. The reaction time of the aerosol particles was very short. At relative humidities below 50%, the reaction was practically independent of the SO2 concentration, and was determined only by the aerosol concentration.

48245 **APTIC NO. 67168**

Hochrainer, D. and G. Zebel

SEPARATION OF AEROSOL PARTICLES BY DIFFUSING GASES. *(Zur Frage der Abscheidung von Aerosolteilchen durch diffundierende Gase). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 147-149. 3 refs. (Oct. 17-18.)*

Experimental study of the separation of aerosol particles from gaseous mixtures by diffusiophoresis, and the implications of this phenomena for particle separation in the lung are described. Two different gases with latex particles 0.82 micron in diameter were sent through parallel canals with a diaphragm filter between them in a diffusion chamber, after which the composition of the two gases was determined by means of Jamin helium-neon laser interferometer. In the case of equimolar counterdiffusion, the rates of aerosol separation on the carbon dioxide side in the CO2-oxygen, CO2-hydrogen, and CO2-air systems was higher than on the opposite side by 11, 61, and 5.3 times, respectively, which is indicative of the entrainment of the particles by the heavier gas. This implies inhibition of the particle separation by CO2 released by tissues in the lung. In the case of diffusion with equal pressure in the diffusion chamber, corresponding to a respiratory coefficient of 0.84, facilitation of the particle separation by diffusiophoresis was observed. The diffusiophoresis was much weaker in this case than during equimolar counterdiffusion. The effect of diffusiophoresis on particle separation in the lung is believed to be insignificant due to the very small concentration gradients occurring there.

48246 **APTIC NO. 69673**

Horak, Jiri

CONTRIBUTION TO THE STATISTICAL DYNAMICS OF TURBULENT DIFFUSION. *Stud. Geophys. Geod., 17(4):362-375, Oct. 1973. 8 refs.*

The statistical dynamics of turbulent diffusion is the analytical method of describing the process based on the formalism of distribution functions, and it leads to an infinite chain of equations satisfied by these functions. Its purpose is to obtain the appropriate transfer equation, and therefore does not rest in determining the random solution of the equation of motion which is known in advance; the explanation of the physical statistics of the process is preceded by the existence of ergodicity and mixing. In this concept, statistical dynamics of turbulent diffusion are closely connected with the problem which may be called a justification of the ergodic hypothesis for a certain dynamic system of statistical mechanics. The transfer equation is linear, and there exists a theorem of existence and uniqueness of the solution for it. Regarding the definition of the probability measure, there exists a wide class of probability measures in phase space with the properties that any linear functional defined is measurable in it. If one considers phase space to be a set of all vectorial fields in which the function of the integral of sigma squared (v) dv (where v is a vector) is finite in any finite region, it is possible to determine the normal probability measures in it. The outlined problems are very close to the problems concerned with the construction of the model of turbulence velocity with respect to expressing the homogeneous nature of the transfer of the diffusing substance at a fixed time. (Author conclusions modified)

48247 **APTIC NO. 67062**

Ishizaki, Chanel and John T. Cookson, Jr.

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):51-53, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Results are presented from experiments investigating the influence of surface oxides on adsorption and catalysis with activated carbon. The adsorbent (Filtrasorb 200) was prepared from coal by high temperature steam activation, while the surface of the carbon was modified by outgassing at high temperature followed by dry oxidation with oxygen at several temperatures (20-500 C) and by room temperature oxidation in aqueous solution of ammonium persulfate. The adsorbates studied were: n-butyl mercaptan, butyl disulfide, decane, p-hydroxybenzaldehyde, and glycine. Adsorption equilibrium for all adsorbates from dilute aqueous solution on the original as well as the outgassed and oxidized carbons was described by the Langmuir equation, with the values of the monolayer coverages being on the order of a few micromoles/sq m. The kinetics of adsorption for n-butyl mercaptan, butyl disulfide, decane, an p-hydroxybenzaldehyde fitted a second-order reversible equation, with affinity of the untreated carbon being the highest for butyl disulfide. Activated carbon in the presence of oxygen catalyzed the oxidation of n-butyl mercaptan to butyl disulfide, and both adsorbates competed for sites. The experiments indicated that while the rate of adsorption for the adsorbates was extremely influenced by the surface oxides, the capacity on an area basis was not.

48248 **APTIC NO. 68305**

Mizutani, Hiroo

INVESTIGATION FOR DETERMINATION OF SULFUR IN HEAVY OILS BY RI METHOD. *(RI-ho ni yoru juyuchu io bunsokutei no kento). Text in Japanese. Nagoya-shi Kogai Kenkyusho-ho (Rep. Environ. Pollut. Res. Inst. City Nagoya), no. 2:43-46, 1973.*

The radioisotope (RI) method is widely used to determine sulfur in heavy oils. This method has the disadvantage of being affected by the properties of heavy oils. The differences of carbon=- hydrogen ratios in heavy oils caused an aerror of 0.01% sulfur; each 1% of water in the heavy oils caused an increase of 0.06% sulfur. Concentrations of 100 ppm nickel and 100 ppm sodium were equal to about 0.06% sulfur and 0.03% sulfur, respectively. The standard deviation of the radioisotope method was about 0.0074%.

48249 **APTIC NO. 70049**

Okada, Nobuhiko, Yusuke Sakamoto, and Yoshihiro [illegible]

A METHOD FOR SAFELY MANUFACTURING HIGH-CONCENTRATION OZONE. *(Konodo ozon wo anzen ni seizo suru hoho). (Osaka Gas Co., Ltd. (Japan)) Japan. Pat. Appl. 46-76560. 3p., Sept. 29, 1971. (1 claim). Translated from Japanese, 8p.*

A method is described for safely manufacturing high- concentration ozone. The ozone generator is cooled by means of the latent heat of evaporation or by the sensible heat of liquid oxygen, liquid air, or a liquefied mixture of oxygen and nitrogen. Ozone is generated by these raw materials. After ozone has been generated within the temperature and pressure range where ozone-oxygen, ozone-air, or ozone-oxygen-nitrogen mixtures can be present in liquid form, the ozone is absorbed by liquid oxygen, liquid air, or a liquefied mixture of oxygen and nitrogen. The mixture is removed from the system as a stable homogeneous mixed solution of ozone-oxygen, ozone-air, or ozone-oxygen-nitrogen. The method does not have the disadvantage of previous methods which allowed decomposition of ozone at higher temperatures. The ozone can be used in sterlizing, deordorizing, or bleaching. It can be used in purification of water or liquid wastes, and in other pollution control methods.

48250 **APTIC NO. 67156**

Penzhorn, R. D.

AEROSOL FORMATION BY IRRADIATION OF SO2, NO AND HYDROCARBONS IN THE AIR. PART I: STUDY OF THE CHEMICAL PROCESSES. *(Aerosolbildung durch Bestrahlung von SO2, NO und Kohlenwasserstoffen in der Luft. Teil I: Untersuchung der chemischen Prozesse). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress. Bad Soden, Germany, 1973, p. 70-71. (Oct. 17-18.)*

The chemical reactions taking place in various combinations of oxygen, nitric oxide, sulfur dioxide, and cis-2-butene under elevated partial pressure in white light were studied in a model experiment by means of a laser aerosol spectrometer. In the SO2-air and SO2-nitirc oxide-air systems there was no aerosol formation in darkness. By irradiation of 0.677 or 0.33 mbar SO2 in air at a wavelength of over 3000 Angstrom, a maximum particle concentration of 400 and 240/cu m, respectively, were measured after 48 hrs. The reaction product obtained was identified as sulfuric acid formed due to UV excitation of SO2 in singulet state. The rate of particle formation increased considerably in the presence of NO, where the native oxygen formed by photolysis can react with molecular oxygen, nitrogen dioxide, and SO2. The reaction product was identified as sulfuric acid. While there was no particle formation in NO-cis-2-butene systems, the presence of SO2 caused intense aerosol formation with H2SO4 as the main reaction product. Carbon dioxide, acetaldehyde, and nitrous oxide were also identified. The formation of aliphatic sulfur compounds is also possible.

48251 **APTIC NO. 67068**

Pitts, James N., Jr., Alan C. Lloyd, and Jeremy L. Sprung

CHEMICAL REACTIONS IN URBAN ATMOSPHERES AND THEIR APPLICATION TO AIR POLLUTION CONTROL STRATEGIES. *Beckman Instruments Process S.A., Geneva (Switzerland), Proc. Int. Symp. Environ. Meas., Geneva, Switzerland, 1973, p. 27-61. 121 refs. (Oct. 2-4.)*

The complex interactions among the various elements of the air pollution system are reviewed. There is a need for a more extensive and reliable data base which would define the ambient levels, chemical and physical interactions, and the toxic effects of air pollutants more accurately. The history and effects of smog are discussed. The health effects of smog, the composition of sulfate particulate, sulfur dioxide synergism, effects of smog on plants, and economic effects of smog are reviewed. The primary air quality standards and emission standards for motor vehicles and stationary sources are also discussed. Societal controls for pollution are reviewed, including transportation control plans such as parking fees and gasoline rationing, smog alerts, and health warning systems. The emission of primary pollutants includes automobile exhausts (carbon monoxide, oxides of nitrogen, hydrocarbons, and particulates) and fuel-burning sources (NOx and sulfur oxides). Emission inventories are necessary to determine the relative contributions of various sources and to evaluate and develop control programs. The three-dimensional structure of smog and the atmospheric chemistry of smog are described, and the following subjects are included: secondary pollutants; smog formation; the conversion of nitric oxide to nitrogen dioxide; thermal oxidation of NO; photooxidation; ozone formation; hydrocarbon photooxidation; the importance of hydroperoxy and hydroxyl radicals and hydrogen atoms; the reaction of HO2 and aldehydes; reactions of HO and nitrous acid; reactions of H atoms, ozone, and olefins; photochemical aerosols; computer models; smog chamber experiments; and ambient air monitoring.

48252 **APTIC NO. 69926**

Prashad, Jagdish

INFLUENCE OF IRRADIATION ON THE THRESHOLD POTENTIAL IN AIR. *Rev. Roumaine Chim. (Bucharest), 18(11):1865-1866, 1973. 6 refs.*

The fall of the electrical conductivity threshold potential, V sub m, under irradiation was observed at various pressures of mercury vapor contaminated air under ozonizer excitation and was ascribed to be due to the occurrence of the positive Joshi effect due to release of photoelectrons by light. (Author abstract modified)

48253 **APTIC NO. 69781**

Sandhu, H. S.

THE ATMOSPHERIC PHOTOCHEMISTRY OF SO2. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta 1973, p. 53-56. 8 refs. (Nov. 1-2.)*

Recent ideas on the mechanisms of homogenous oxidation of sulfur dioxide are reviewed. The excited states of SO2 and its quenching mechanism are discussed. Semi-empirical methods are presented for calculating the necessary Arrhenius rate parameters where they are not available from experiments. (Author abstract modified)

48254 **APTIC NO. 67158**

Schoeck, Werner

AEROSOL FORMATION BY IRRADIATION OF SO2, NO AND HYDROCARBONS IN THE AIR. PART II:

STUDY OF THE AEROSOL-PHYSICAL PROCESSES. (Aerosolbildung durch Bestrahlung von SO2, NO und Kohlenwasserstoffen in der Luft). Teil II: Untersuchung der aerosolphysikalischen Prozesse). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 77-80. 2 refs. (Oct. 17-18.)

The rate of aerosol formation and particle size distribution were studied as a function of the concentration and composition of the original substances and of the radiation intensity in different combined systems of sulfur dioxide, nitric oxide, and butene at high concentrations but low radiation intensity corresponding to 0.001% of the solar constant. In a mixture composed of 0.33 mbar SO2, NO, and cis-2-butene each in air with 70% relative humidity, a stationary state with constant particle concentration and particle size distribution established itself in two days. All particles disappeared upon cessation of the irradiation, while renewed irradiation resulted in quantitative recombination of the particles. During irradiation, sufficient supersaturation is achieved, whereby droplet aerosol particles are condensed spontaneously and homogeneously. The reaction products formed in the further course of the irradiation are condensed on the existing droplets, which results in a particle growth with constant particle concentration. The resulting sedimentation leads to the spontaneous formation of new, homogeneous condensed nuclei, and equilibrium is reached after a certain time between the settling and newly condensed droplets. Under the conditions of increased irradiation intensity, the range of particle size distribution will increase, there will be no particle concentration peak, and the particle concentration will decrease. The particle concentration was highest in the SO2-NO-butene system, while the NO-butene system supplied no detectable aerosol. The concentration maximum was dependent only on the relative composition of the initial substances, not on their absolute partial pressure.

48255 **APTIC NO. 67080**

Siekhaus, W. and T. Novakov

STUDY OF SO2 ADSORPTION ON A STEPPED PLATINUM SINGLE CRYSTAL SURFACE BY PHOTOELECTRON SPECTROSCOPY. *California Univ., Berkeley, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-ENG-48, 6p., March 1973. 1 ref.*

Sulfur dioxide was adsorbed at room temperature, under UHV conditions on a stepped single crystal surface of platinum, and observations were made with X-ray photoelectron spectroscopy. The observed energies and intensities of oxygen, sulfur, and platinum photoelectron lines showed the SO2 to decompose at the Pt surface to form a surface sulfide. The sulfur is chemisorbed on the surface via electron transfer from Pt to S. Only a small fraction of that oxygen stays on the surface, probably in the molecular form. The O2 fragment leaves the surface in about 75% of the SO2 adsorption events leading to the sulfide formation. (Author abstract modified)

48256 **APTIC NO. 67120**

Smith, Jerome Paul

REACTIONS OF SULFUR DIOXIDE IN THE PRESENCE OF NITROGEN DIOXIDE AND PROPYLENE. *Colorado Univ., Boulder, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 161p. 117 refs.*

Reactions of sulfur dioxide in the presence of nitrogen dioxide and propylene were studied along with attempted product identifications. The rate of SO2 photooxidation was greatly accelerated in the presence of both NO2 and propylene, with the rate of SO2 disappearance being as high as 0.02 ppm/min. Increasing the propylene concentration from 3 ppm to 12 ppm while holding the NO2 concentration constant at 1.7 ppm and SO2 at 2 ppm increased the rate of the SO2 reaction, whereas increasing the NO2 concentration from 0.9 to 10.2 ppm while holding the propylene concentration constant at 6 ppm decreased the SO2 reaction rate. Relative humidity at 50% did not affect the photochemical reaction of the three compounds, though 75% relative humidity caused a rapid dark reaction. A mixture of 2 ppm SO2, 1.2 ppm NO2, and 6 ppm propylene produced much aerosol upon irradiation, while a mixture containing 2 ppm SO2, 6 ppm propylene, and 5.5 ppm NO2 produced no aerosol upon irradiation and no measurable SO2 reaction upon irradiation. A mixture containing 6 ppm propylene, 1.2 ppm NO2, and no SO2 also produced no aerosol upon irradiation. No identifications were made of the wall products from the photochemical reaction or of the aerosol formed from the photochemical reaction.

48257 **APTIC NO. 67157**

Zerull, R.

MICROWAVE ANALOGY EXPERIMENTS ON LIGHT SCATTERING BY NONSPHERICAL DUST PARTICLES. *(Mikrowellenanalogieversuche zur Lichtstreuung an nicht kugelfoermigen Staubpartikeln). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 72-76. 6 refs. (Oct. 17-18.)*

The scattering functions of spheres with rough surfaces, cubes, and octahedrons were studied by microwave analogy experiment, in multiplying both the wavelength and the particle size by an identical factor of an order of magnitude of 10,000. Individual scattering bodies hanging on a thin nylon cord were irradiated, and the scattered radiation was received by a rotary receiving antenna. For spheres with rough surfaces, the deviation in the scattering behavior from spheres with smooth surfaces was negligible in both monodisperse and polydisperse mixtures. There were major differences in the scattering behavior of spheres and cubes as well as octahedrons. An essentially isotropic scattering behavior persisted at high scattering angles in the case of cubes, and the intensity in the medium angle ranges was larger than for spheres by nearly one order of magnitude, but no increase in the backward scattering was observed. The polarization behavior of cubes was essentially neutral, while dielectric mixtures caused negative polarization. The increase in the intensity in the medium ranges of the scattering angle was less pronounced for octahedrons than it was for cubes.

48258 **APTIC NO. 67077**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR CHLORINE IN COAL. *Book ASTM Stand., vol. 19:372-374, 1973. 6 refs.*

Standard D 2361-66 is presented for measuring the total chlorine content of coal. The method consists of oxidation of the sample by combustion and absorption of the chlorine in alkaline reagents. The method, apparatus, reagents, procedure, calculations, and precision of the method are described.

48259 **APTIC NO. 67078**

American Society for Testing and Materials, Philadelphia, Pa

STANDARD METHOD OF TEST FOR TOTAL SULFUR IN NATURAL GAS BY HYDROGENATION. *Book ASTM Stand., vol. 19:424-427, 1973. 2 refs.*

Standard D 3031-72 is presented for determination of the total sulfur in natural gas by hydrogenation. The method covers determination of S in natural gas containing not more than 1.0 grain of S/100 cu ft and not more than 0.5% of C5 and heavier hydrocarbons. A measured sample of gas is mixed with humidified hydrogen and passed over a platinum gauze at 900 C in a tube furnace. Organic sulfur in the gas is converted to hydrogen sulfide, which is absorbed in a zinc acetate solution and determined by the methylene blue procedure. The method, apparatus, reagents, calibration, procedure, calculation, and precision of the method are discussed.

1972

48260 **APTIC NO. 67144**

Bitterwolf, Thomas E. and A. Campbell Ling

METALLOCENE BASICITY II. REACTION OF THE FERROCENONIUM CATION WITH O2 AND SO2. *J. Organometal. Chem., 40(1):C29-C32, 1972. 21 refs.*

A study by Wasserman claimed the preparation of a series of stable ferrocenium adducts involving various postulated radical counter ions of the form (HA)-. This claim of stable radical acid anions caused considerable consternation since it appears to violate presently known chemical behavior. Other studies gave little or no support to the presence of any species (HA)- and seemed to indicate that these adducts were simply solvated ferrocenium salts. Another study presented strong evidence against Wasserman s interpretation of room temperature electron spin resonance spectra of the uniquely prepared adduct series. A tensiometric titration of ferrocene in trifluoroacetic acid with oxygen at room temperature and pressure was conducted which confirmed the stoichiometry implied by a reaction of oxidation by oxygen. A secondary reaction of O2 with ferrocenium occurs after the initial reaction is complete. The decomposition appears to be radical-induced. A reaction mechanism that will explain the observed oxidation is postulated which concludes that the protonated ferrocene, ferrocenonium ion, is involved in the oxidation. The anomalous reaction of ferrocene with sulfur dioxide in acid solution was also studied, and a reaction mechanism was developed. Ferrocenonium is an anti-knock agent used in gasoline.

1970

48261 **APTIC NO. 70127**

Belyaev, S. P.

USE OF INTERMITTENT ILLUMINATION IN AEROSOL RESEARCH. *Hydrometeorological Service (USSR), Main Administration and Inst. of Experimental Meteorology (USSR), Prob. Fix. Oblakov Akt. Vozdeistv., Moscow, USSR, 1970, no. 19. 31 refs. Translated from Russian in: Cloud Physics and Weather Modification, Proc., p. 95-106, 1974, by H. Olaru, Israel Program of Scientific Translations, Jerusalem.*

NTIS: TT 73-50031

The classical experimental methods used in aerosol mechanics should use recording of particle trajectories and velocities by means of high-intensity flashing light sources. In some cases, this recording method can help to reveal errors made by the classical experimental methods, thereby ensuring the success of the investigations. Particle trajectory recording by means of intermittent illumination can be a suitable and promising technique for solving problems to which no satisfactory solution yet exists. The possibilities of the method are illustrated by several examples, including particle aspiration and deposition, particle concentration fluctuations, droplet separation and coalescence, and particle rebound from obstacles. The results of experimental work on aspiration conducted with this technique were in particularly good agreement with theoretical results.

1966

48262 **APTIC NO. 75035**

Guichard, J. C.

DESIGN AND TESTING OF A DILUTION CHAMBER FOR AEROSOLS. *(Construction et etude d une chambre a dilution pour aerosols). National Inst. of Applied Chemical Research, Vert-le-Petit (France), Research Center, Rept. 32-1966, Aug. 5, 1966. 3 refs. Translated from French, 31p.*

Modern devices for in situ examination of aerosols require low numerical concentrations, smaller than the quantities generally found in nature or the laboratory. The aerosols must therefore be diluted; an aerosol dilution chamber is described. The chamber provides an indispensible intermediate step between real particle populations and their quantitative measurement. Previously tested or proposed systems are also reviewed.

EFFECTS-HUMAN HEALTH

1977

48263 **APTIC NO. 69464**

Coffin, D. L., D. E. Gardner, F. J. Miller, and E. J. Blommer

INFLUENCE OF MODE OF DOSE ON TOXICITY OF NITROGEN DIOXIDE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 21p., 1975 (?). 27 refs.*

Dose-response studies with laboratory mice were conducted to determine the relative toxicity of the following types of nitrogen dioxide exposure: short exposure versus the same concentration times time product (CxT) over a longer period, continuous dose versus intermittent application, and superimposition of a spike on a low basal dose versus continuous and intermittent applications at a single concentration. The experiments involved exposing two groups of mice to an aerosol of bacterial pneumonia and then exposing one of the groups to gaseous nitrogen dioxide. A CxT value of 7 was used, based on the published minimal effective dose for NO2 by the infectivity model (3.5 ppm times 2 hr). A significant increase in mortality with increasing time was observed for exposures to 0.5 ppm and 3.5 ppm NO2. Intermittent exposure to 3.5 ppm NO2 (7 hr/day, 7 days/week) also resulted in a significant linear increase of mortality with time. Short exposures to high concentrations of NO2 resulted in greater toxicity than exposures to equivalent CxT doses administered over a longer period, illustrating the importance of accurately recording peak NO2 values.

1975

48264 **APTIC NO. 70084**

Brooks, Stuart M.

EARLY DETECTION OF LUNG CANCER IN HIGH RISK POPULATIONS. *J. Occup. Med., 17(1):19-22, Jan. 1975. 49 refs. (Industrial Medical Association, Annual Meeting, 59th at the American Industrial Health Conference, Bal Harbour, Fla, April 29-May 2, 1974.)*

The screening and diagnostic methods available for early detection and treatment of lung cancer are reviewed. Chest X-rays and sputum cytology are presently the most accepted screening tests. They have high specificities, but disappointingly low sensitivities. Diagnostic procedures are more sensitive and include fiberoptic bronchoscopy, bronchograph, special X-ray studies, and biopsy. Etiologic agents of environmental origin which may cause lung cancer are also reviewed. These include uranium, nickel carbonyl, Bis(chloromethyl)ether, chloromethyl methyl ether, arsenic trioxide, polycyclic organic matter (in cigarette tar, urban pollution, or work exposures), asbestos, and chromates. Recent evidence suggests that the metabolite of a chemical rather than the parent compound may be carcinogenic. The complexity of this observation is illustrated by the large number of metabolites of benzo(a)pyrene. When formulating preventive medicine programs with regard to lung cancer, identification of host factors seems necessary. High risk factors should be identified early since it is not possible to remove all potential carcinogen exposures from the worker s environment.

48265 **APTIC NO. 70092**

Landrigan, Philip J., Stephen H. Gehlbach, Bernard F. Rosenblum, Jimmie M. Shoults, Robert M. Candelaria, William F. Barthel, John A. Liddle, Ann L. Smrek, Norman W. Staehling, and JoDean F. Sanders

EPIDEMIC LEAD ABSORPTION NEAR AN ORE SMELTER. *New Engl. J. Med., 292(3):123-129, Jan. 16, 1975. 34 refs.*

Blood lead levels were determined on a random sample of persons in all age groups living near a lead-emitting smelter in El Paso, Texas. A blood lead level of greater than or equal to 40 micrograms/100 ml, which was considered indicative of undue lead absorption, was found in 53% of the children 1-9 years old living within 1.6 km of the smelter and in 18% of those from 1.6 to 6.6 km away; beyond that distance and in older persons, the levels were lower. Children in the first 1.6 km with blood levels of greater than or equal to 40 micrograms/100 ml were exposed to 3.1 times as much lead in dust as children living in the area with lower blood values (6447 versus 2067 ppm). There was also airborne lead exposure of 8-10 micrograms/cu m, annual mean. Paint, water, food, and pottery were less important as sources. Thus, particulate lead in dust and air probably accounted for most of the lead absorption in El Paso children. The smelter was the principal source of this lead, especially within 1.6 km of the smelter. (Author abstract)

48266 **APTIC NO. 70088**

Russell, M. A. H. and C. Feyerabend

BLOOD AND URINARY NICOTINE IN NON-SMOKERS. *Lancet, 1975:179-181, Jan. 25, 1975. 12 refs.*

Of 39 urban nonsmokers, about half had measurable quantities of nicotine in their plasma (0-5.5 ng/ml) and almost all had nicotine in their urine during the early afternoon before exposure to tobacco smoke from smokers seated in the same smoke-filled room. The average concentration of urinary nicotine in nonsmokers under natural conditions was 10.7 ng/ml, but after deliberate exposure to tobacco smoke (mean duration of 78 min) in the unventilated room with 38 ppm carbon monoxide levels, the average urinary nicotine level (80 ng/ml) was significantly higher than in nonsmokers who had not been deliberately exposed to smoke. Under natural conditions there was no overlap between the urine levels of nonsmokers and the far higher levels of 18 smokers (mean 1236 ng/ml), suggesting that urinary nicotine may provide a more accurate assessment of an individual s smoking status than blood carboxyhemoglobin concentrations. As a result of passive smoking, most urban nonsmokers have measurable amounts of nicotine in their body fluids for most of their lives. (Author abstract modified)

1974

48267 **APTIC NO. 68301**

Allison, A. C.

PATHOGENIC EFFECTS OF INHALED PARTICLES AND ANTIGENS. *Ann. N. Y. Acad. Sci., vol. 221:299-308, 1974. 32 refs.*

The size and shape of inhaled particles affects their deposition and retention. Large particles are deposited on the mucociliary escalator of the nasal passages or respiratory tree. Smaller particles can penetrate to the alveoli, where they usually pass rapidly through the surfactant lining and are ingested by macrophages. Although many inhaled dust particles are innocuous, certain dusts such as silica and asbestos can stimulate a fibrogenic reaction in the lungs. The effects of particles on macrophages are therefore relevant to the pathogenesis of pneumoconioses. Available evidence suggests that silica stimulates collagen synthesis by a two-stage mechanism: The particles damage macrophages and release a factor that increases collagen synthesis by fibroblasts. Asbestos particles which are long and thin are not completely ingested by macrophages. There is some evidence that they can directly stimulate fibroblasts in culture to synthesize collagen. Asbestos inhalation can cause carcinogenesis; in occupationally exposed humans, asbestos increases the incidence of bronchogenic carcinomas as well as mesotheliomas. Particle size can effect fibrogenic and carcinogenic effects and cell growth. The role of macrophages in relation to inhaled antigens has received little attention. Immune complexes can stimulate the synthesis and release of lysosomal enzymes from macrophages. In view of the relationship between the effects of particles on macrophages and fibrogenesis, it is tempting to speculate that immune complexes formed from inhaled antigens may, through effects on macrophages, stimulate collagen synthesis in lungs. This is a possible explanation for the pathogenesis of extrinsic fibrosing alveolitis. (Author abstract modified)

48268 **APTIC NO. 69958**

Carnow, Bertram W.

CHICAGO AIR POLLUTION MORBIDITY STUDIES - SO_2 AND PARTICULATE LEVELS AND ACUTE ILLNESS IN PATIENTS WITH CHRONIC BRONCHOPULMONARY DISEASE (FINAL REPORT). *Illinois Univ., Chicago, School of Public Health, Illinois Institute for Environmental Quality Proj. 10.011, Rept. IIEQ 74-26, 212p., Feb. 1974.*

NTIS: PB 233660

A series of morbidity studies were conducted to investigate the relationship between air pollution (sulfur dioxide and particulates) and acute respiratory illness in individuals living in the Chicago area and suffering from chronic bronchopulmonary disease. A registry of individuals with chronic bronchopulmonary disease was developed. Each patient s illness severity was assessed, and environmental exposure was estimated with a personal pollution index. Subjects 55 yr and older with advanced bronchitis tended to report an increased frequency of illness with increased levels of pollution. This effect was enhanced when illness was compared with pollution levels 24 hr earlier. Although relationships between sulfur dioxide and particulates and episodes of acute respiratory illness were found, inconsistencies between day of pollution and day of onset were noted. Multiple regression analysis of the relationship between illness as measured by emergency visits and environmental variables such as SO_2, particulates, humidity, rainfall, temperature, and snowfall revealed positive associations with SO_2 and particulates during the winter, particulates and humidity during the summer, and negative correlations with rainfall and snowfall in spring and fall. Hospitalizations during a high air pollution episode in 1969 were also highly correlated with SO_2 levels.

48269 **APTIC NO. 69404**

Creasia, D. A.

IMPAIRMENT OF PULMONARY CLEARANCE OF INHALED PARTICLES BY RESPIRATORY INFECTION. *In: Biology Division Annual Progress Report for Period Ending June 30, 1974. Oak Ridge National Lab., Tenn., Biology Div., Atomic Energy Commission Contract W-7405-eng-26, p. 174-175, Nov. 1974.*

NTIS: ORNL-4993

To avoid criticism of a study in which (51)chromic oxide particles are administered by intratracheal instillation, an inhalation chamber was designed for nose-only exposure to an aerosol of (51)Cr_2O_3 particles. The aerosol generated by pneumatic aspiration of a suspension of (51)Cr_2O_3 particles in distilled water is forced to maneuver through a series of baffles designed to remove the larger particles, so that respiratory-tract deposition will be mostly of small particles deposited in the deep lung. Using the inhalation chamber, a small experiment was designed with inhaled (51)Cr_2O_3 to compare with the previous finding of impaired pulmonary clearance of intratracheally administered (51)Cr_2O_3 particles. Twenty-one mice were exposed to a (51)Cr_2O_3 aerosol for 3.5 hr. Seven of these mice were infected with a PR8 influenza virus on the same day, and seven others were infected 12 days before aerosol exposure. The remaining animals were maintained as uninfected controls. The usual course of viral infection is such that a stage of acute pneumonitis is produced 10-14 days after exposure, with subsequent, often permanent, fibrotic scarring of the lung tissue. When the animals were infected on the same day as aerosol exposure, impairment of pulmonary clearance first became obvious 6-18 days after infection. Thereafter, particle clearance remained slower and was drastically reduced compared to the controls. When the aerosol exposure coincided with the peak of the infection, clearance of the aerosol from the lungs was almost immediately impaired and remained so for at least 60 days afterward. The conclusions derived from studies on the effect of infection on pulmonary clearance of inhaled and intratracheally administered (51)Cr2O3 were essentially the same. Both studies indicated that infection does impair pulmonary clearance and that the degree of impairment bears a relationship between time of particle exposure and time of viral infection.

48270 **APTIC NO. 69405**

Creasia, D. A. and J. K. Poggenburg, Jr.

SUITABILITY OF 103RU-LABELED CARBON PARTICLES FOR LONG-TERM PULMONARY-CLEARANCE STUDIES. *In: Biology Division Annual Progress Report for Period Ending June 30, 1974. Oak Ridge National Lab., Tenn., Biology Div., Atomic Energy Commission Contract W-7405-eng-26, p. 175-176, Nov. 1974.*

NTIS: ORNL-4993

Since carbon particles are the particles most commonly associated with environmental carcinogens and polynuclear aromatic hydrocarbons, it was decided to use small carbon particles labeled with a gamma-emitting isotope when the pulmonary clearance effect seen with (51)chromic oxide was tested with other particles. Five hamsters were given intratracheal injections of 20 micrograms of 0.5 to 1.0 micron carbon particles labeled with ruthenium(103) to determine whether Ru(103) remained with the carbon particle. At the end of 5 days, 15% of the Ru(103) had been eliminated from the animals, 6% in the urine and 9% in the feces. The lungs retained an average of 96% of the Ru(103) found in the intact animal. Thus, the amount of (103)Ru-labeled carbon measured by whole-body counting of the intact animal was representative of the lung burden, the Ru(103) remained attached to the carbon particles, and the (103)Ru-labeled carbon particles were suitable for long-term pulmonary-clearance studies.

48271 **APTIC NO. 69406**

Creasia, D. A.

IN VIVO DISSOCIATION OF CARCINOGEN AND CARRIER PARTICLE. *In: Biology Division Annual Progress Report for Period Ending June 30, 1974. Oak Ridge National Lab., Tenn., Biology Div., Atomic Energy Commission Contract W-7504-eng-26, p. 176-177, Nov. 1974.*

NTIS: ORNL-4993

The role of ferric oxide dust when used as a carrier particle for a carcinogen has been studied extensively. The findings strongly suggest that the major mechanism of the Fe2O3-mediated enhancement of the tumorigenic response of the lung to benzo(a)pyrene is related to carcinogenic clearance. Subsequent studies with other carrier particles, namely aluminum and carbon showed that carcinogen retention and tumorigenicity does not always go hand in hand, and therefore other factors such as surface activity, alteration of carcinogen metabolism, or lack of sufficient release of the carcinogen from the carrier particle might also play a decisive role. The in vivo release of benzo(a)pyrene from the carrier particle carbon was studied in 20 mice given intratracheal injections of benzo(a)pyrene attached to 0.5 to 10 micron carbon particles and carbon particles labeled with ruthenium(103). The carbon was eliminated much more slowly from the lung than the benzo(a)pyrene. It took 6 days to clear 50% of the carbon, while in only 2 days 50% of the benzo(a)pyrene was eliminated; and by day 4 less than 20% remained. This rate of elimination was slower, however, than if small benzo(a)pyrene crystals alone had been instilled intratracheally. The data suggest a slow but steady dissociation of the benzo(a)pyrene from the carbon particles. The tumorigenicity of benzo(a)pyrene attached to the carbon particles was enhanced. This slow but steady release of benzo(a)pyrene to the lung is more favorable in delivering a carcinogenic dose to the target tissue.

48272 **APTIC NO. 69407**

Creasia, D. A.

INHALATION COCARCINOGENESIS STUDIES WITH NITROGEN DIOXIDE, FORMALDEHYDE, AND ACROLEIN. *In: Biology Division Annual Progress Report for Period Ending June 30, 1974. Oak Ridge National Lab., Tenn., Biology Div., Atomic Energy Commission Contract W-7405- eng-26, p. 177-178, Nov. 1974.*

NTIS: ORNL-4993

Hamsters were treated intratracheally with a carcinogen at dose levels that produce few, if any, respiratory-tract tumors and then were exposed to either nitrogen dioxide, formaldehyde, or acrolein by inhalation techniques. With each gas, some groups of animals were exposed to the gas simultaneously while others were exposed to the gas after carcinogen treatment in a typical promotion-type scheme. The gas-exposure and carcinogen-treatment protocols are summarized. The groups exposed to NO2 were the first groups to be started, and consequently, at this time most have died. The CH2O and C3H4O exposures were initiated later. The formaldehyde-exposed animals were approximately at the midpoint of their life span, and it is expected that most of the animals will die within a year. Histological evaluation of all dead animals is incomplete, and it is too early to predict the cocarcinogenic effect, if any, of these three gases. The cumulative mortality data of the animals exposed to the three gases are presented in a table.

48273 **APTIC NO. 69306**

Dolgner, R., L. Pelech, and P. Schmidt

THE REACTION OF THE SCHOOLCHILD TO AIR POLLUTANTS - RESULTS AND EXPERIENCES FROM SEVERAL YEARS OF STUDIES. *(Die Reaktion des Schulkindes auf Luftverunreinigung - Ergebmisse und Erfahrungen aus mehrjaehrigen Untersuchungen). Text in German. Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig. A, 227(1-4):101-109, 1974. 7 refs.*

The nondisease effects of urban or industrial air pollution were studied in schoolchildren aged 9 to 13 years from Gelsenkirchen and Westerland. The annual average dust concentration measured 287 micrograms/cu m in the years 1967 and 1968 and was four times as high as that measured in Westerland, the sulfur dioxide and nitrogen dioxide concentrations in those years measured in Gelsenkirchen 181 micrograms/cu m and 60 micrograms/cu m and were 11 times as high as in Westerland. In particular, the effects of air pollution on body size, bone growth, size of tonsils lymph nodes, the hemoglobin level, and on the number and resistance of erythrocytes were examined. The preliminary study compared children of a heavily polluted city (Gelsenkirchen) with children of a city with low pollution (Westerland). The main part of the study compared children from areas with low contrast of air pollution for which four municipalities in the southwest of Freiburg/Breisgau, Federal Republic of Germany were selected. In those municipalities the combined dust and SO2 concentrations reached one fourth of the concentrations in Gelsenkirchen and measured on the average in the years 1967-71, 206 micrograms dust, 56 micrograms NO2, and 179 micrograms SO2/cu m. In the second main study, children from Bork, Selm, and Polsum, were studied. Their extent of air pollution assumed a middle position between Gelsenkirchen and the four municipalities near Freiburg/Br. The results are illustrated in graphs. The chronic effects of air pollutants in the urban-industrial atmosphere on schoolchildren become apparent in a number of changes of biological parameters such as a larger number of enlarged tonsils and lymph nodes among the exposed children as well as retarded bone growth, lower HbE-values, and lower hydrogen chloride resistance of the erythrocytes.

48274 **APTIC NO. 69638**

Finklea, John F., Julius Goldberg, Victor Hasselblad, Carl M. Shy, and Carl G. Hayes

PREVALENCE OF CHRONIC RESPIRATORY DISEASE SYMPTOMS IN MILITARY RECRUITS: CHICAGO INDUCTION CENTER. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 4-23 to 4-36, May 1974. 19 refs.*

NTIS: PB 234 920/AS

Chronic respiratory disease prevalence rates among military recruits who lived in more polluted urban core and suburban areas of Chicago were significantly higher than chronic bronchitis rates in recruits from rural and smaller urban areas in the outstate Illinois-Indiana area. Excesses in morbidity were noted among blacks, whites, smokers, and nonsmokers, although not all were statistically significant. The hazards of ambient air pollution and self-pollution by cigarette smoking seemed additive. Exposures lasting 12 years or more to ambient air pollution characterized by elevated annual average levels of sulfur dioxide (96 to 217 micrograms/cu m), suspended sulfates (14 micrograms/cu m), and suspended particulates (103 to 155 micrograsm/cu m) were accompanied by significant increases in the frequency of chronic respiratory disease symptoms. (Author summary)

48275 **APTIC NO. 69633**

Finklea, John F., Dorothy C. Calafiore, Cornelius J. Nelson, Wilson B. Riggan, and Carl G. Hayes

AGGRAVATION OF ASTHMA BY AIR POLLUTANTS: 1971 SALT LAKE BASIN STUDIES. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p.2-75 to 2-91, May 1974. 25 refs.*

NTIS: PB 234 920/AS

Four panels, totaling 211 asthmatics, reported asthma attacks using weekly diaries for 6 mo during 1971. The panels represented low exposure, intermediate I, intermediate II, and high exposure groups. The principal point of sulfur dioxide emissions, a copper smelter, was located 38 mi southwest of Ogden, 13 mi west of Salt Lake City, 8 mi northwest of Kears, and 5 mi north of Magna; these communities were the four exposure areas, respectively. Excess asthma attack rates could be attributed to colder days and to ambient air pollutants. Total suspended particulates and suspended sulfates had significant effects at minimum temperature ranges greater than 30 F. The strongest effects were attributed to suspended sulfates; the most consistent effects were caused by suspended particulates; and the least impressive effects could be attributed to sulfur dioxide exposures for the higher temperature range considered (greater than or equal to 50 F). The threshold estimates for the lower temperature range (30-50F) were 107 micrograms/cu m for total suspended particulates and 17.4 micrograms/cu m for suspended sulfates. For the higher temperature range, the threshold levels were 23-54 micrograms/cu m for SO2, 71 micrograms/cu m for total suspended particulates, and 1.4 micrograms/cu m for suspended sulfates. The importance of chemical composition in determining effect thresholds was seen in the comparison of the threshold level for suspended particulates containing high sulfates with that for particulates with relatively low sulfate content (26 and 71 micrograms/cu m, respectively). The effects of suspended nitrates were also noted. (Author summary modified)

48276 **APTIC NO. 69636**

Finklea, John F., Douglas I. Hammer, Dennis E. House, Charles R. Sharp, William C. Nelson, and Gene R. Lowrimore

FREQUENCY OF ACUTE LOWER RESPIRATORY DISEASE IN CHILDREN: RETROSPECTIVE SURVEY OF FIVE ROCKY MOUNTAIN COMMUNITIES, 1967-1970. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 3-35 to 3-56, May 1974. 26 refs.*

NTIS: PB 234 920/AS

Acute respiratory morbidity in asthmatic children began to increase with exposures to low annual average levels of sulfur dioxide (67 micrograms/cu m) when moderately elevated levels of total suspended particulates (99 to 115 micrograms/cu m) were present in a study of five Rocky Mountain smeltering communities in Montana and Idaho. Significant excesses in acute lower respiratory illness, especially croup, appeared among asthmatic and nonasthmatic children exposed to higher pollution levels for 3 or more years. Such levels involved estimated annual average sulfur dioxide levels of 177 micrograms/cu m accompanied by low estimated annual average levels of particulates (65 micrograms/cu m) and minimally elevated estimated average levels of suspended sulfates (7.2 micrograms/cu m). There was also suggestive evidence that more serious infectons, including pneumonia, that might require hospitalization tended to be more frequent in children exposed to these elevated pollution levels. Other determinants of respiratory illness included age, sex, smoking, social status, and recent intercommunity migration. Future studies will be required to validate the morbidity reductions that should follow pollution control. (Author summary)

48277 **APTIC NO. 69639**

Finklea, John F., Jean G. French, Gene R. Lowrimore, Julius Goldberg, Carl M. Shy, and William C. Nelson

PROSPECTIVE SURVEYS OF ACUTE RESPIRATORY DISEASE IN VOLUNTEER FAMILIES: CHICAGO NUSERY SCHOOL STUDY, 1969-1970. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 4-37 to 4-55, May 1974. 12 refs.*

NTIS: PB 234 920/AS

A prospective survey of over 2500 members of volunteer families indicated that those individuals living more than 3 years in high pollution areas (107-250 micrograms/cu m sulfur dioxide and 137-165 micrograms/cu m total suspended particulates) had significantly increased rates of acute respiratory illness, restricted activity, and otitis media when compared to individuals living in less polluted areas (109-130 micrograms/cu m SO2 and 121-123 micrograms/cu m total suspended particulates). It is possible that more recent lower air pollution levels contributed to increased respiratory illness. During the study, SO2 levels in the lower pollution areas were around 57 micrograms/cu m compared with 51 to 106 micrograms/cu m in the higher pollution areas; for total suspended particulates, the levels were around 11 micrograms/cu m, compared with 126 to 151 micrograms/cu m. Children and adults living in neighborhoods wih cleaner air wered measurably less susceptible to etiologically undefined illness and to epidemic influenza as well. Families with higher socio-economic status generally reported more illness. Residential mobility proved a significant determinant of illness, and cigarette smoking by mothers seemed related to increased susceptibility among the youngest preschool children. None of these intervening variables could account for the effects attributed to ambient air pollutants. Improvements of air quality can thus significantly reduce the incidence of respiratory illnesses. (Author summary)

48278 **APTIC NO. 69643**

Finklea, John F., John H. Farmer, Gory J. Love, Dorothy C. Calafiore, and G. Wayne Sovocool

AGGRAVATION OF ASTHMA BY AIR POLLUTANTS: 1970-1971 NEW YORK STUDIES. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 5-71 to 5-84, May 1974. 22 refs.*

NTIS: PB 234 920/AS

Increased asthma attack rates among 148 panelists who completed weekly diary reports were linked to suspended particulate and suspended sulfate air pollution in a New York City study. The effects of suspended nitrates and sulfur dioxide on asthma were also noted. Pollutants exerted an effect only on days in which the minimum temperature was above freezing. The estimated threshold level for total suspended particulates was very low, 56 micrograms/cu m, and that for suspended sulfates was 12 micrograms/cu m. On warmer days (minimum temperature above 50 F), the threshold estimate for suspended sulfates was lower, 7.3 micrograms/cu m, and no good estimate for the total suspended particulate threshold could be established. Suspended particulate and suspended sulfate air pollution, like ambient temperature, may very well eventually be identified as important determinants of asthma attack rates in urban America. (Author summary modified)

48279 **APTIC NO. 69647**

Finklea, John F., Carl M. Shy, Gory J. Love, Carl G. Hayes, William C. Nelson, Robert S. Chapman, and Dennis E. House

HEALTH CONSEQUENCES OF SULFUR OXIDES: SUMMARY AND CONCLUSIONS BASED UPON CHESS STUDIES OF 1970-1971. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, EPA-650/1-74-004, p. 7-1 to 7-24, May 1974. 19 refs.*

NTIS: PB 234 920/AS

Studies describing a variety of pollutant relationships with several health indicators are summarized. The pollutants of main concern were sulfur dioxide, total suspended particulates, and suspended sulfates. The impact of community differences in exposure to these pollutants on chronic respiratory disease in adults, acute lower respiratory disease in children, acute respiratory illness in families, aggravation of symptoms in subjects with preexisting asthma and cardiopulmonary disease, and lung function of schoolchildren were examined. These indicators were selected because past studies by many investigators indicated that the frequency of these responses in a community was affected by sulfur oxides and particulates. The studies substantiated these findings. Health indicators are divided into those responsive to long-term or short-term exposures. Least case, worst case, and best judgment estimates concerning the pollutant thresholds for long-term exposures are given. The findings support the existing National Primary Standards for long-term or annual average exposures. Least case, worst case, and best judgment estimates are also presented for short-term exposures. Adverse effects on elderly subjects with heart and lung disease and on panels of asthmatics are being experienced even on days below the National Primary Standard for 24-hour levels of SO2 and total suspended particulates. These adverse health effects should be attributed to suspended sulfate levels rather than to the observed concentrations of these pollutants. Because of the lack of knowledge of control methods, biological reactivity, and effects of sulfates, a National Standard for this pollutant cannot now be established. (Author conclusions modified)

48280 **APTIC NO. 69641**

Goldberg, Harvey E., John F. Finklea, Cornelius J. Nelson, Walter B. Steen, Robert S. Chapman, Donald H. Swanson, and Arlan A. Cohen

PREVALENCE OF CHRONIC RESPIRATORY DISEASE SYMPTOMS IN ADULTS: 1970 SURVEY ON NEW YORK COMMUNITIES. *In: Health Consequences of Sulfur Oxides. Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1/74-004, p. 5-33 to 5-47, May 1974. 24 refs. NTIS: PB 234 920/AS*

Chronic respiratory disease morbidity was assessed in 6004 parents of elementary school children residing in either a clean Long Island community or one of two more polluted communities in New York City. Long-term exposures (up to 20 years) to sulfur dioxide levels of an estimated 144 to 404 micrograms/cu m and suspended sulfate levels of an estimated 9 to 24 micrograms/cu m were associated with marked increases in chronic bronchitis prevalence among smokers, ex-smokers, and non-smokers of both sexes, age 20 to 50. The effects of suspended nitrates, total suspended particulates, and dust fall were also noted. Shorter term, more recent exposures to lower pollutant levels may also induce, aggravate, or sustain chronic respiratory disease symptoms. Such short-term exposures might involve annual average SO2 levels of 50 to 60 micrograms/cu m accompanied by annual average suspended sulfate levels of about 14 micrograms/cu m and total suspended particulate levels of about 60 to 105 micrograms/cu m. In the present study, the observed differences between communities could not be accounted for by age, occupational exposures, smoking habits, or ethnic factors. It is unlikely that nonrespondent bias or intercommunity socio-economic differences could have explained the observed intercommunity differences in prevalence rates. An analysis of migration patterns indicated that improvement of air quality was associated with striking decreases in chronic bronchitis prevalence and that moving into a polluted city from a relatively clean area was associated with an increased risk of chronic bronchitis. Air pollution and self- pollution by cigarette smoking appeared to be additive hazards. Improvements in air quality may be expected to benefit the population by reducing chronic respiratory disease symptom frequency and severity. (Author summary modified)

48281 **APTIC NO. 69644**

Goldberg, Harvey E., Arlan A. Cohen, John F. Finklea, John H. Farmer, Ferris B. Benson, and Gory J. Love

FREQUENCY AND SEVERITY OF CARDIOPULMONARY SYMPTOMS IN ADULT PANELS: 1970-1971 NEW YORK STUDIES. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Health Center, Rept. EPA-650/1-74-004, p. 5-85 to 5-108, May 1974. 24 refs.*

NTIS: PB 234 920/AS

Over 500 elderly New York City panelists who were well or who reported cardiopulmonary symptoms participated in a diary study linking aggravation or induction of symptoms to fluctuations in ambient air pollutants (dust fall, nitrogen dioxide, suspended nitrates, sulfur dioxide, total suspended particulates, and suspended sulfates) and minimum daily temperature. Panelists were previously diagnosed by a physican as healthy (without cardiopulmonary symptoms), having heart disease, having lung disease, or having combined heart and lung disease. Both temperature and pollutants were associated with changes in symptom status. Decreasing temperatures induced or aggravated symptoms in all but the heart disease panelists, who reported worsening of symptoms with elevations in ambient temperature. Elevated levels of sulfur dioxide, total suspended particulates, and especially suspended sulfates, were linked to symptom exacerbations. However, within temperature-specific ranges, suspended sulfates exhibited the strongest and most consistent association with symptom aggravation. The best estimate of threshold levels was less than or equal to 10 micrograms/cu m for suspended sulfates. The implications of these thresholds in light of current pollution levels and the relative importance of seasonal swings in temperature are discussed, and the problem is judged to be of considerable public health significance. (Author summary modified)

48282 **APTIC NO. 69635**

Hayes, Carl G., Douglas I. Hammer, Carl M. Shy, Victor Hasselblad, Charles R. Sharp, John P. Creason, and Kathryn E. McClain

PREVALENCE OF CHRONIC RESPIRATORY DISEASE SYMPTOMS IN ADULTS: 1970 SURVEY OF FIVE ROCKY MOUNTAIN COMMUNITIES. *In: Health Consquences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N.C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 3-19 to 3-33, May 1974. 41 refs.*

NTIS: PB 234 920/AS

Chronic bronchitis prevalence and symptom scores in nonoccupationally exposed adult residents of two high-exposure Rocky Mountain smeltering communities in Idaho and Montana significantly exceeded morbidity rates found in residents of three low-exposure communities. Age-adjusted excess bronchitis was observed within sex and smoking categroies. Nonsmokers in high-exposure communities had exceess bronchitis prevalance rates 2.4 to 2.8 times those of nonsmokers in low-exposure areas. The effect of community exposure was additive to that of cigarette smoking, which exerted an effect on chronic bronchitis approximately seven times stronger than that of air pollution. Symptom scores confirmed area differences shown from bronchitis prevalence rates. Through more prevalent, bronchitis was not more severe in high-exposure communities. Comparison of residence duration-specific rates demonstrated that prolonged residence in high-exposure areas magnified the excess bronchitis attributable to pollutant exposure. Occupational exposure further increased observed bronchitis morbidity. Excess bronchitis occurred with 2- to 3-year exposure to sulfur dioxide concentrations of 177 to 374 micrograms/cu m and suspended sulfate concentrations of 7.2 to 19.9 micrograms/cu m in the presence of low total suspended particulates. Metallic sulfates may well have accounted for the excess bronchitis. (Author summary)

48283 **APTIC NO. 69955**

Higgins, I. T. T.

EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE: A LITERATURE REVIEW. *Michigan Univ., Ann Arbor, Mich., Dept. of Epidemiology, Environmental Protection Agency Contract PH-86-68-142, Program Element 1AA005, Rept. EPA-650/1-74-007, ROAP 21BLE, 138p., Aug. 1974. 590 refs.*

NTIS: PB 237375/AS

An epidemiological review of the chronic respiratory diseases asthma, chronic bronchitis, and emphysema is presented with reference to the etiological role of air pollution. Topics covered include: temporal, spatial, and socioeconomic effects of chronic respiratory disease; the methodology for epidemiological studies of such diseases; and factors in the etiology of chronic respiratory disease, including age, sex, race, genetics and physiology, air pollution, occupation, allergies, smoking habits, infections, weather and climate, and socioeconomic status. The etiological role of air pollution is considered in terms of acute air pollution episodes, variation in mortality, morbidity, and lung function with time, geographical differences, diseases among children and homogeneous occupational groups, Yokohama and New Orleans asthma studies, and dose-response relationships. The most important factor in the natural history of chronic respiratory disease appears to be smoking; relationships of general air pollution and of occupational exposures to chronic respiratory disease are less consistent. Episodes of excessive air pollution cause appreciable mortality and morbidity, however, with many of the victims being those already disabled with heart or lung disease. Studies on young people in Britain indicate that residence in polluted areas plays a significant part in the early development of chronic respiratory disease. Excessive chronic respiratory disease is also observed among workers in dusty occupations.

48284 **APTIC NO. 69490**

Hinners, Thomas A.

ATOMIC ABSORPTION ANALYSIS OF NBS LIVER STANDARD INVOLVING SIMPLE ACID EXTRACTION. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 6p., Oct. 4, 1974. 11 refs.*

Extraction of NBS (National Bureau of Standards) Bovine Liver Standard with 1% nitric acid was used to provide cadmium, copper, iron, manganese, and zinc data on metal content of the tissue in agreement with the certified values. Data obtained when 10 replicate 1-gram portions of the liver standard were extracted for 24 hours at room temperature with 10 ml of 1% nitric acid are presented. Metal measurements were achieved with an atomic absorption spectrophotometer employing the conventional aspiration procedure and calibrating with commercial standards diluted in 1% nitric acid free of detectable Cd, Cu, Fe, Mn, and Zn. A time profile is presented on the metal extrations when 0.25-gram portions of the liver were mixed in plastic bottles with 50 ml of 1% acid and agitated continually on an oscillating shaker. Acid extration of Bovine Liver Standard provided close agreement with NBS values for Cd, Mn, Zn, and Cu. Although the acid treatment did not yield the NBS concentration range for iron, other extracting solutions currently being studied have shown promise for Fe analysis. However, the utility of tissue iron values is limited by the presence in tissue specimens of variable amounts of blood, which typically contain 420-560 mixrograms/ml of iron. A study of several biological tissues is in progress comparing ashing with a variety of extracting solutions. Hair and rice have been subjected to acid extraction. A warning is issued that trichloroacetic acid, commonly used to deproteinate solutions, may be converted to very toxic phosgene in an air-acetylene flame.

48285 **APTIC NO. 70267**

Hirose, Toshio, Hidetoshi Mitobe, Hidehiro Hasebe, Keiko Oibayashi, and Toshio Horiuchi

FIGHT AGAINST CHRONIC OBSTRUCTIVE LUNG DISEASES - AN APPROACH TO POLLUTION CAUSED LUNG DISEASES. *(Mansei heisokusei hai shikkan e no torikumi: osen ni yoru hai shikkan e no apuroochi). Text in Japanese. Preprint, All Japan Democratic Medical Union, p. 38, 1974. (Presented at the All Japan Democratic Medical Union, Scientific Meeting, 2nd, Sendai, Japan, Oct. 26-27, 1974.)*

It is believed that the morbidity of chrionic obstructive lung diseases is increasing rapidly due to air pollution. In the Sake General Hospital, Miyagi Prefecture, 5% of the outpatients in the internal medicine and pediatric departments are chronic obstructive lung disease patients. Among the 317 persons who received the spiro tests between January and August 31, the 1-second rate was between 50-70% in 19.6% of the examinees, and 17% had the high obstructive rates of less than 55%. Between 1973 and 1974, in addition to the spiro tests, blood gas analysis, respiratory resistance, and flow volume tests were added for general examinations for patients. Some diagnostic standards were set, and some patients were checked for emphysema. The flow volume and chest X-ray permeability index were also examined. The airway sensitivity was judged by checking the lung capacity after an oral administration of a dilation agent. For suspicious cases of asthma, further examinations were given.

48286 **APTIC NO. 69631**

House, Dennis E., John F. Finklea, Carl M. Shy, Dorothy C. Calafiore, Wilson B. Riggan, J. Wanless Southwick, and Lyman J. Olsen

PREVALANCE OF CHRONIC RESPIRATORY DISEASE SYMPTOMS IN ADULTS: 1970 SURVEY OF SALT LAKE BASIN COMMUNITIES. *In: Health Consequences of Sulfur Oxides. A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 2-41 to 2-54, May 1974. 16 refs.*

NTIS: PB 234 920/AS

The effect of sulfur dioxide and suspended sulfate exposure on the prevalence of chronic respiratory disease symptoms was studied in four communities in the Salt Lake Basin: Ogden (the low exposure area 38 mi northeast of a large copper smelter which was the primary source of SO2), Salt Lake City (the intermediate I exposure area approximately 13 mi east of the smelter), Kearns (the intermediate II exposure area 8 mi southeast of the smetler), and Magna (the high exposure area 5 mi northwest of the smelter). The effects of total suspended particulates, dust fall, nitrogen dioxide, and suspended particulates were also noted. The prevalence of chronic bronchitis increased significantly among smokers and nonsmokers of both sexes after 4 to 7 years of exposure to ambient air pollution characterized by elevated annual levels of SO2 (92-95 micrograms/cu m) and suspended sulfates (15 micrograms/cu m) accompanied by low levels of total suspended particulates (53-70 micrograms/cu m). Among the 7635 adults who comprised the study population, chronic bronchitis prevalence was highest in smokers, intermediate in exsmokers, and lowest in lifetime nonsmokers, The effects of air pollution and self-pollution by smoking cigarettes appeared to be additive. Occupational exposure to irritating dusts, fumes, gases, or aerosols was a strong determinant of illness after age 40, having twice the effect of air pollution and over half the effect of cigarette smoking. Community pollution seemed to influence migration patterns in that there was a relative deficit of persons with chronic respiratory disease symptoms among new arrivals in the high exposure community; furthermore, there was evidence that symptomatic persons preferentially migrated away from the high exposure community. All segments of society should gain substantial health benefits with the control of SO2 air pollution. (Author summary modified)

48287 **APTIC NO. 69227**

Irodova, Y. V.

EFFECT OF INDUSTRIAL DISCHARGES CONTAINING CARCINOGENIC AND TOXIC SUBSTANCES ON THE SPREAD OF LUNG CANCER. *(O vliyanii primyshlennykh vybrosov, soderzhashchikh kantserogennyye i toksicheskiye veshchestva, na rasprostraneniye raka legkogo). Text in Russian Gigiena i Sanit., no. 7:6-10, 1974. 11 refs.*

The effect of toxic and harmful air pollutants, such as sulfur dioxide, nitrogen oxides, phenol, and dust, as well as carcinogenic substances such as benzo(a)pyrene on the incidence of respiratory diseases and lung cancer was studied in an epidemiological surveys conducted in two big cities with similar climatic and socioeconomic conditions but with very great differences in the pollutant levels. The incidence of respiratory diseases, such as pneumonia, bronchitis, and catarrh of the upper respiratory tract, was by 1.9 and 1.8 times higher in males and females without occupational exposure to polluted air in the polluted city than it was in the city with a low pollution level. While the lung cancer morbidity remained at the initial level in the city with low pollution level during the survey period covering 14 years, it increased considerably from the beginning to the end of the survey period in the highly polluted city. In the latter, the lung cancer mortality increased by 1.4 times in the male population, and decreased by 1.35 times in the female population during the survey period. In the highly polluted city, the lung cancer mortality was both significantly higher than in the slightly polluted city, and increased by 1.9 and 1.8 times in the male and female populations, respectively, during the survey period. The mortality in males was highest between 40 and 59 years of age in the highly polluted city, and over 70 years in the slightly polluted city. The average number of years the lung cancer patients had lived in the respective cities with high and low pollution levels before the emergence of the disease was 30 and 41 year, respectively.

48288 **APTIC NO. 70105**

Jokl, Miloslav

SOME NATURAL LAWS ABOUT HARMFUL AGENTS IN THE HUMAN ENVIRONMENT. *J. Theor. Biol., 48(1):1-9, 1974. 1 ref.*

The human environment may be regarded as a complex system having three features: sources of harmful agents, a zone of transport, and the subject attacked. The human environment may, from the physical viewpoint, be called the field of transfer, or perhaps the field of harmful agents, and can be expressed by a general differential equation. On the basis of this equation, it is not only possible to derive differential equations for various fields, according to the type of agent (such as a gas or heat), but also to formulate some generally valid principles: the effect of any type of agent must be evaluated not only on the basis of its concentration in the environment (which usually determines only the potential harmfulness of the substance), but also by the dose per unit time--the intensity of flow; it is possible to derive dimensionless groups of variables which ensure the validity of scale model experiments. (Author abstract)

48289 **APTIC NO. 67074**

Kimbrough, Renate D. and Ralph E. Linder

THE TOXICITY OF TECHNICAL HEXACHLOROBENZENE IN THE SHERMAN STRAIN RAT. A PRELIMINARY STUDY. *Preprint, Environmental Protection Agency, Chamblee, Ga., Chamblee Toxicology Lab., 10p., 1974 (?). 14 refs.*

Technical grade hexachlorobenzene (HCB), a fungicide to control bunt of wheat and a waste by-product from chlorinated hydrocarbon production, was fed to groups of 10 male and 20 female rats at the dietary levels of 0, 100, 500, and 1000 ppm for 4 mo. None of the control rats and none of those fed 100 ppm HCB died prior to sacrifice. Two of 10 males and 14 of 20 females died at the dietary level of 500 ppm, and three of the males as well as 19 of the females died at the dietary level of 1000 ppm. Compared to the control group, the liver, spleen, adrenals, lungs, and kidneys weighed more in the groups that were exposed to the 500 and 1000 ppm levels of HCB. Various morphological changes were observed in the livers of the experimental animals. In addition, hyperplasia of the adrenal cortex, as well as large numbers of macrophages in pulmonary alveoli and lung fibrosis were noted. Since the HCB fed to the rats was only between 93-95% pure, additional studies are necessary to elicit whether the reported pathology is entirely due to the effect of HCB. (Author abstract modified)

48290 **APTIC NO. 70266**

Kimura, Sachie, Toyoko Taruya, and Saburo Saito

INVESTIGATION OF PHYSICAL DAMAGES BY CADMIUM POLLUTION IN THE ANNAKA AREA, NO. 1. *(Annaka chiku, kadomiumu osen ni yoru jintai higai chosa (daiippo)). Text in Japanese. Preprint, (All Japan Democratic Medical Union, p. 51, 1974. (Presented at the All Japan Democratic Medical Union, Scientific Meeting, 2nd, Sendai, Japan, Oct. 26-27, 1974.)*

In the Annaka area, the sulfur dioxide gas and heavy metals emitted from the Toho Zinc Co. and Annaka Refinery has caused agricultural damage since 1935. West of the refinery, the Nishi-Iwai district is particularly affected heavily by cadmium pollution and the soil and rice are heavily laden with Cd; the area is designated as a Cd-polluted area by law. Examinations on the human helath have been conducted since 1968. In 1973, it was declared that no known symptom of Cd poisoning had manifested itself in this area. However, since the environment is heavily polluted by Cd, even without the known symptoms of Cd poisoning, Cd must be affecting the human health in some form. Urinalysis and other investigations have been conducted since 1973; the sugar and protein levels in the urine of residents in the area were normal, but the Cd level was generally very high, and some extraordinarily high Cd values were found in several people. Investigations of the relationship between the Cd level and deformation in hands (bent fingers) also seemed to suggest a positive relationship. Further investigations will be conducted.

48291 **APTIC NO. 69870**

Kiyono, S., K. Ohoba, and Y. Ichinoto

EFFECTS OF AUTO EXHAUST ON HUMAN BODY. *(Jodosha haiki gasu ni yoru jintai eikyo chosa kekka ni tsuite). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 2:41-48, April 1974.*

The inhabitants who lived near an intersection in a heavy traffic district in Miyagi Prefecture have been taking health examinations since 1971. The methods for examination are inquiry tests, blood tests, urine tests, and lung function tests. Since the enforcement of a traffic regulation in 1973, the carbon monoxide concentration has decreased remarkably (now 6 ppm 24-hour mean value). The amounts of dust and lead are also less than before (approximately, 0.2 mg/cu m for dust; 0.2-0.4 microgram/cu m for lead). However, the nitrogen oxides concentration is around 9 ppm, which is about 1.5 times higher than that before the traffic regulation. On the other hand, the average numbers of passing vehicles is about 900 cars/hr which is 1.3 times more than before. No significant differences occurred between men and women every year with regard to respiratory symptoms. The rate of the appearance of cough and phlegm symptoms was higher in men than in women. This rate was almost the same over the years, or tended to decrease. There was also no difference in this district compared with other districts. Bronchial asthma for these 3 years occurred in 2.9% of all examinees in their medical histories. The amount of lead in blood (mean value) was higher (about 20 microgram/dl) in men than in women for these past 3 years. Both the red cell count and the amount of hemoglobin decreased every year in men and women.

48292 **APTIC NO. 69468**

Kjeldsen, Knud, Henrik K. Thomsen, and Poul Astrup

EFFECTS OF CARBON MONOXIDE ON MYOCARDIUM. ULTRASTRUCTURAL CHANGES IN RABBITS AFTER MODERATE, CHRONIC EXPOSURE. *Circulation Res., vol. 34:339-348, March 1974. 36 refs.*

Exposure chamber experiments were conducted with 16 castrated male albino rabbits to investigate the effects of carbon monoxide on myocardial ultrastructure. Half of the animals were exposed to 180 ppm of CO, while the other half were exposed to atmospheric air for 2 weeks. Local areas of partial or total necrosis of the myofibrils and degenerative changes of the mitochondria were observed in rabbits exposed to CO. Extra- and intracellular edema, increases in the number of ribosomes and lipofuscin granules, and reparative fibrotic changes also occurred in these animals. Varying degrees of blood vessel injury were noted, with capillary edema observed in some areas. Total stenosis never occurred. Statis and occasional small perivascular hemorrhages were typical on the venous side. The characteristic picture on the arterial side was one of endothelial swelling, formation of subendothelial edema, and degenerative changes of the myocytes. The findings support of the hypothesis that chronic exposure to low levels of carbon monoxide produces myocardial damage and accounts for the increased risk of myocardial infarction and sudden death seen in heavy cigarette smokers.

48293 **APTIC NO. 69461**

Knelson, John H.

HEALTH EFFECTS OF OXIDANT EXPOSURES: A RESEARCH PROGRESS REPORT. *Preprint, California Air Resources Board, 31p., Dec. 9, 1974. 21 refs. (Presented at the Technical and Medical Bases for Control Strategies of Photochemical Oxidant Conference: Current Status and Priorities in Research, Dec. 16-17, 1974.)*

Toxicological, clinical, and epidemiological studies of the effects of photochemical oxidants (ozone) on humans and laboratory animals are reviewed in relation to the Environmental Protection Agency s research program designed to determine the adequacy of the current ambient air quality standard (photochemical oxidants) of 160 micrograms/cu m (maximum 1-hour concentration). Human studies demonstrate the deleterious effects of photochemical oxidants on resistance to respiratory infections, respiratory tract and eye irritation, exacerbation of symptoms in persons with chronic lung disease, decrement in lung function, and impaired exercise performance. Pulmonary function changes in healthy males (ages 20-27) were observed in one study after only 2 hr exposure to concentrations of ozone (800 micrograms/cu m) comparable to levels occurring in the Los Angeles basin during pollution episodes. Animals studies corroborate the findings on humans and, in addition, suggest that increases in cytogenetic abnormalities and fetal wastage, as well as interference with immune mechanisms may occur at ambient ozone levels.

48294 **APTIC NO. 69208**

Kodama, Yasushi, Eizaburo Kunitake, Koichi Nobutomo, Michiko Urabe, and Noburu Ishinishi

LEAD LEVEL IN BLOOD OF JAPANESE IN RELATION TO ENVIRONMENTAL CONCENTRATION OF LEAD. *(Kankyochu enryo to kecchu enryo to no kanren ni tsuite no kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 29(3):365-378, Aug. 1974. 24 refs.*

The lead levels in the blood of 361 Japanese people were determined and compared to the environmental concentrations. In Fukuoka, the atmospheric Pb levels were 5.65 to 1.33 micrograms/cu m at a congested intersection and less than 1.0 micrograms/cu m in a residential section. The arithmetic mean Pb levels in the blood of men and women near the intersection were 14.9 micrograms/100 g and 1.0 micrograms/100 g and in the residential section 12.1 micrograms/100 g and 10.6 micrograms/100 g respectively. In Ishigaki Island (Okinawa), the atmospheric Pb concentrations were less than 1.0 micrograms/cu m and the average concentration of Pb in the blood was 18.8 micrograms/100 g for men and 14.4 micrograms/100 g for women. The average concentration of atmospheric Pb in three printing offices was less than 1.5 micrograms/cu m, while the highest mean blood Pb level was 15.9 micrograms/100 g in 122 workers. Atmospheric Pb levels in the working room of an underground parking lot were less than 2.0 micrograms/cu m. The mean levels in the blood were 19.9 micrograms/100 g for men and 15.9 micrograms/100 g for women. The blood levels were lower in the office areas. The average concentration in a room where soldering was done was 2.1 micrograms/cu m. The mean blood Pb level of women was 15.7 micrograms/100 g. The average blood Pb levels and 95% fiducial limits obtained from the basis of the theoretical log normal distribution curve were 12.4 micrograms/100 g and 40.9 micrograms/100 g in 249 men, 11.1 micrograms/100 g and 28.8 micrograms/100 g in 112 women, and 12.0 micrograms/100 g and 36.1 micrograms/100 g for all 361 people.

48295 **APTIC NO. 69642**

Love, Gory J., Arlan A. Cohen, John F. Finklea, Jean G. French, Gene R. Lowrimore, William C. Nelson, and Peggy B. Ramsey

PROSPECTIVE SURVEYS OF ACUTE RESPIRATORY DISEASE IN VOLUNTEER FAMILIES: 1970-1971 NEW YORK STUDIES. *In: Health Consequences of Sulfur Oxides. Report from CHESS, 1970-1971. Environmental*

Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 5-49 to 5-69, May 1974. 15 refs.

NTIS: PB 234 920/AS

A prospective survey of over 3000 volunteers from families living in three communities with differing air pollution exposures in New York City and Suffolk County attributed significant increases in the frequency and severity of acute lower respiratory illness to ambient air pollutants. Exposures of 2 to 3 years involving 256 to 321 micrograms/cu m of sulfur dioxide accompanied by 97 to 123 micrograms/cu m of total suspended particulates and 10 to 15 micrograms/cu m of suspended sulfates were linked to excessive illnesses. The effects of suspended nitrates were also noted. There was suggestive evidence that control of air pollution substantially decreases susceptibility to acute lower respiratory illness. The average family of four might expect to experience 5 extra days of restricted activity and one extra physician visit each year as a result of the excess acute lower respiratory disease morbidity. Illness frequency increased with increasing socio-economic status, recent family migration, cigarette smoking in the home, and parental history of chronic bronchitis. (Author summary modified)

48296 **APTIC NO. 69248**

Moore, Wellington, Jr., Larry Hall, Walden Crocker, Joan Adams, and Jerry F. Stara

METABOLIC ASPECTS OF METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL IN RATS. *Environ. Res., 8(2):171-177, Oct. 1974. 3 refs.*

Whole-body retention, excretion, and tissue distribution of radioactive manganese were studied in rats following oral and intravenous doses of labeled methylcyclopentadienyl manganese tricarbonyl (MMT), a potential antiknock agent for nonleaded gasoline. An initial rapid excretion of most of the radioactive manganese occurred following both routes of administration. Extraction of urine and feces after dosing indicated that the MMT was metabolized and that the radioactive manganese was excreted in the inorganic form. The high levels of radioactive manganese found in the urine after MMT dosing were not typical of normal manganese excretion. Highest concentrations of manganese following MMT administration were found in the liver, kidneys, and lungs. In vitro experiments indicated that MMT was metabolized in the liver, lung, kidney, and to a small extent in the brain. Metabolism of MMT by kidney homogenate supported the hypothesis that biotransformation occurred in the kidney and explained the high levels of urinary excretion of inorganic radioactive manganese. The whole-body retention curves for radiomanganese-labeled MMT and radiomanganese-labeled manganese chloride were very similar and were consistent with the hypothesis that MMT is rapidly metabolized. Both curves for radioactive manganese reflected the kinetics of inorganic manganese.

48297 **APTIC NO. 70273**

Mostardi, Richard A. and Donald Leonard

AIR POLLUTION AND CARDIOPULMONARY FUNCTIONS. *Arch. Environ. Health, vol. 29:325-328, Dec. 1974. 13 refs.*

Measurements of vital capacity, forced expiratory volume, maximal midexpiratory flow, and maximal indirect oxygen consumption were made on 42 high school students (all male) from an urban industrialized area (Barberton, Ohio) and on 50 similar students (all male) from a rural area (Revere, Ohio). All of the subjects were drawn from original populations that were studied 3 yr prior for vital capacity and forced expiratory volume. The results were similar to those of the first study, with the Barberton group showing a lower mean vital capacity (4.65 l) than the Revere group (5.04 l). Neither forced expiratory volume nor maximal midexpiratory flow were significantly different between the two groups, though maximal indirect oxygen consumption was 40.73 versus 43.94 ml/kg/min for the Barberton and Revere groups, respectively. Since air pollution levels (sulfur trioxide, dust fall, and total suspended particulates) were consistently higher in Barberton, such pollutants appeared to be contributory factors in the impairment of cardiopulmonary functions.

48298 **APTIC NO. 69303**

Muhar F. and A. Raber

EFFECTS OF NITROUS FUMES UPON THE LUNG. *(Wirkungen von Nitrosegasen auf die Lunge). Text in German. Pneumonol. (Berlin), 150(2-4):113-129, 1974.*

After a thorough discussion of the accidental poisoning of 34 workers by large amounts of nitrous fumes in an Austrian chemical plant producing artificial fertilizer and its effects on the lung along with therapeutical measures taken, the chronic effects of long-term exposure to nitrous gases are reviewed. Nitrous gases are a mixture of various oxidation states of nitrogen such as nitric oxide, nitrogen dioxide, N2O4, and nitric anhydride plus vapors of nitrous and nitric acid. The percentage of the various oxidation states in the mixture differs at the moment of development. The individual components of the gas mixture change in dependence on the ambient temperature and the humidity. A different mixture of nitrous gases develops, therefore, at welding operations, blasts, in the chemical industry, in the glass industry, at the production of fertilizer, in the exhausts of combustion engines, and in smoking of cigarettes. The irritations caused by nitrous gases on mucous tissue increase with rising relative humidity. The presence of NO ameliorates the toxic effect of NO2. Oil mists protect against the effects of nitrous gases. The addition of sulfur dioxide is supposed to reduce the toxicity of nitrous gases, provided the SO2 concentration is considerably higher than the concentration of nitrous gases. Exposure of rats and mice to concentrations of less than 1 ppm nitrous gases caused structural changes in the lung similar to pulmonary edema in humans. A literature review is given, the references for which are available from the author upon request.

48299 **APTIC NO. 69632**

Nelson, William C., John F. Finklea, Dennis E. House, Dorothy C. Calafiore, Marvin B. Hertz, and Donald H. Swanson

FREQUENCY OF ACUTE LOWER RESPIRATORY DISEASE IN CHILDREN: RETROSPECTIVE SURVEY OF SALT LAKE BASIN COMMUNITIES, 1967-1970. *In: Health Consequences of Sulfur Oxides. A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 2-55 to 2-73, May 1974. 11 refs.*

NTIS: PB 234 920/AS

The effects of sulfur dioxide and suspended sulfate air pollution were isolated from the influence of elevated total suspended particulates and oxides of nitrogen (as suspended nitrates and nitrogen dioxide) in a statistical retrospective study of students from the areas of Ogden (low exposure area), Salt Lake City (intermediate I exposure area), Kearns (intermediate II exposure area), and Magna (high exposure area). The primary source of SO2 emissions was a large copper smelter located approximately 5 mi north of Magna, 8 mi northwest of Kearns, 13 mi west of Salt Lake City, and 38 mi southwest of Ogden. The frequency of single or repeated eposides of acute lower respiratory illness in 9000 preschool and elementary school children significantly increased (40-50%) after exposures to elevated levels of SO2 (91 micrograms/cu m) and suspended particulate sulfates (15 micrograms/cu m) lasting over 2 years. Longer exposures, roughly 9 years, to lower annual average levels of suspended sulfates (9 micrograms/cu m) resulted in smaller increments (22%) in acute lower respiratory morbidity. As expected, a personal history of asthma and age were the most powerful determinants of acute lower respiratory illness. When partnets polluted the home environment by smoking cigarettes, their preschool children more frequently contracted bronchitis or pneumonia.

Socio-economic factors behaved in a complex fashion. Families with higher social status repored increased croup, increased bronchitits, and decreased pneumonia. Physician diagnostic customs were examined and were similar in all communities. A 15% sample of questionnaire responses was validated from physican records, and no intercommunity differences in confirmation of questionnaire responses were noted. (Author summary modified)

48300 **APTIC NO. 69546**

Niemeier, Richard W.

METABOLISM OF BENZO(A)PYRENE BY THE ISOLATED PERFUSED RABBIT LUNG. *Cincinnati Univ., Ohio, Dept. of Environmental Health, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974, 130p. 216 refs.*

The metabolism of benzo(a)pyrene by isolated perfused rabbit lung was studied along with the chemical composition of pulmonary metabolites produced under various conditions in order to gain insight into the mechanism of the primary carcinogenic event or the responsible metabolite for this event. Four hypotheses were suggested as possibly leading to the oncogenic process. First, peripheral lung tissue metabolized the available BaP brought to it by the blood and excreted into the blood a number of metabolites, including epoxides, which eventually entered the pulmonary veins, traversed the heart and entered the systemic circulation. Alternatively, peripheral lung tissue dumped these metabolites into the alveolar spaces, with the metabolites moving up the mucociliary blanket or being engulfed by alveolar macrophages with subsequent movement up the tract to the region of the bifurcations. A third possible hypothesis involved the engulfment of BaP by macrophages, movement up the mucociliary tract, and subsequent metabolism, with the movement of the macrophages up the respiratory tract and resulting lysis of the macraphages by toxic phenols resulting in the release of metabolites including epoxides or other carcinogenic metabolites, to the bronchiolar tissue. A final hypothesis was the metabolism by bronchiole and tracheal epithelial cells.

48301 **APTIC NO. 70246**

Norpoth, K., U. Witting, M. Springorum, and C. Witting

INDUCTION OF MICROSOMAL ENZYMES IN THE RAT LIVER BY INHALATION OF HYDROCARBON SOLVENTS. *Int. Arch. Arbeitsmed., 33(4):315-321, 1974. 22 refs.*

The possibility of increase of microsomal enzyme activities in the liver by inhaled hydrocarbon solvents has been tested in preliminary investigations with male Wistar rats. The animals were exposed 5 hr/day to an atmosphere containing various solvents in a test period of 10 or 28 days. Dichloromethane, carbon tetrachloride, trichloroethylene, and benzene in a concentration of 450-500 ppm caused slight increases of cytochrome P450 and/or of aminopyrine demethylase activity after 10 days. At a test period of 28 days, 50 ppm of carbon tetrachloride led to an increase of cytochrome P450 in the liver cell. With prolonged exposure, even small solvent concentrations in the respiratory air may lead to undesirable alterations in biotransformation of foreign substances and endogenous compounds in the liver. (Author abstract)

48302 **APTIC NO. 69176**

Okamoto, T.

ON THE LUNG FUNCTION OF INHABITANTS IN AN AIR POLLUTED REGION: A DISCUSSION CONCENTRATED ON THE FLOW-VOLUME CURVES. *(Taiki osen chiiki no jumin no hai kino ni tsuite - furo boriumu kyokusen o chushin ni shite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):422, Oct. 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 552.)*

An investigation of lung function was carried out by history taking, determination of flow-volume curves, and chest roentgenography on 1433 inhabitants of a neighboring region (A) and 586 inhabitants of a surrounding region (B) of a coastal industrial area in which the yearly average concentration of sulfur dioxide was 0.036 ppm, nitrogen dioxide was 0.035 ppm, and dust fall was 0.064 mg/cu m. The morbidity of asthma according to the histories was 20.4% (A) and 14.3% (B). The 1-second rate of flow-volume curve less than 70% was 4.6% (A) and 4.2% (B), and there were no differences of percentages of 70% and larger than 80%. The percent of showing less than 40 l/sec of V50 was 55% (A) and 53% (B); however, the percent showing less than 1.5 l/sec of V25 was 61.4% (A) and 56.8% (B). Abnormal subjects with less than 70% of the 1-second rate was 63.9% (A) and 71.6% (B). Histories and lung function tests show a higher abnormality in (B) where complaints are lower. Several values obtained by flow- volume curve showed that the peak flow value decreased abruptly at age 50 in (A) and at 60 in (B).

48303 **APTIC NO. 70269**

Pontefract, R. D.

INGESTION OF ASBESTOS. *Can. Res. Develop., 1974: 21, Nov.-Dec. 1974. 9 refs.*

The possible health hazard of orally ingested asbestos is considered. About 50% of asbestos particles inhaled eventually find their way into the digestive tract, although the percent of fibers that penetrate the intestine is exceedingly small, less than 0.1%. Experiments with rats receiving 1% dietary supplements of chrysotile fibers demonstrate, however, that orally ingested asbestos does penetrate the intestine and enter the bloodstream. If asbestos is carried throughout the body by the bloodstream, the assumption that tumors may develop in areas of the body distant from the gastro-intestinal tract appears reasonable. Animal-feeding experiments are currently in progress to investigate possible whole body tumorigenic effects of asbestos. The question of the actual health hazard of orally ingested asbestos has not been resolved to date.

48304 **APTIC NO. 66922**

Primak, A. V., K. V. Grigor eva, V. N. Polyakov, and T. S. Shpilevaya

METHODS FOR THE GLOBAL ASSESSMENT OF AIR POLLUTION. *(Metody summarnoy otsenki zagryazneniya vozdushnoy sredy). Text in Russian. Gigiena i Sanit., no. 8:81-84, 1974. 3 refs.*

Known methods for the global assessment of air pollution are presented, and a new method satisfying hygienic requirements is proposed. The complex assessment of air pollution requires a dimensionless index which is independent of the quantity of the non-interacting pollutants, and permits the assessment of the contribution of different air pollutants to the overall pollution hazards, as well as the comparison of pollution levels in space and time. At the same time, this index should take the relative toxicities of and interactions between individual air pollutants, and also the effect of meteorological factors on their toxicity and reactions. A formula permitting the determination of the degree of harmfulness of the individual pollutants for the complex characterization of air pollution is proposed on the basis of the ratio of actually measured pollutant concentration to the hazardous concentration resulting in physiological changes upon exposure for a definite time. This formula can be used to determine the degree of hazards from the exposure to air pollutants in industrial atmosphere.

48305 **APTIC NO. 69245**

Raber, A.

EPIDEMIOLOGIC STUDIES OF INHALATION DAMAGES. *(Die epidemiologische Bedeutung inhalativen Noxen). Text in German. Pneumonol. (Berlin), 150(2-4):67-76, 1974. 18 refs.*

The microcensus of 1970 revealed that 2.22 million people out of a population of 60.4 million suffered from respiratory complaints. In 552,000 persons, respiratory symptoms had persisted for more than 1 year. It is difficult to estimate the percentage of patients suffering from sequelae of inhalation damage. Certain accidental influences of irritative gases are of minor importance. With the exception of pneumoconioses, inhalation damages are also rare in occupational diseases liable for compensation. In epidemiologic studies about the frequency of inhalation damages in risk groups or in the total population, a number of methodological problems must be considered: effect of different admission rates; decrease in efficiency of serial examinations by false-positive results; and difficulties in applying the technique of multivariate-linear regression in setting up relations between parameters of pulmonary function and concentrations of harmful substances in the air. Applying new interpretory techniques will make possible the analysis of more complex problems. New biometric models include computer simulation of industrial hazards and the polychotome linear logistic model.

48306 **APTIC NO. 70272**

Schaplowsky, A. F., F. B. Oglesbay, J. H. Morrison, R. E. Gallagher. and William Berman, Jr.

CARBON MONOXIDE CONTAMINATION OF THE LIVING ENVIRONMENT. A NATIONAL SURVEY OF HOME AIR AND CHILDREN S BLOOD. *J. Environ. Health, 36(6):569-573, May/June 1974. 11 refs.*

Carboxyhemoglobin levels from 2299 children and carbon monoxide concentrations from 1820 dwelling units in congested, economically deprived, high-risk (CO exposure) areas among 25 residential communities were measured. A total of 22.5% of the children examined had COHb levels of 3% or more, with levels as high as 7.99% recorded. Carbon monoxide concentrations of 10 ppm or more were measured in 16.8% of the dwelling units tested. A total of 399 fuel-burning appliances were the cause of elevated CO levels, with improper venting, lack of maintenance, and defective appliances being the principal causes of the high CO production. A larger portion of mobile homes showed elevated CO levels compared to either single or multiple type dwellings.

48307 **APTIC NO. 68768**

Scheidemandel, V.

CARBON MONOXIDE AND CORONARY HEART DISEASE. *(Kohlenmonoxyd und koronare Herzerkrankung). Text in German. Herz/Kreisl., 6(1):16-17, 1974. 19 refs.*

Studies on the relationship between increased carboxyhemoglobin levels in the blood and coronary heart disease in smokers and city dwellers are reviewed. The evidence of myocardial infarction in significantly higher in smokers than in nonsmokers which is due, apart from nicotine which promotes coronary arteriosclerosis, to inhaled carbon monoxide which leads to increased carboxyhemglobin levels and most likely plays a role in the risk of arteriosclerosis and coronary heart disease. Aprat from combining with hemoglobin, CO increases the circulation rate and the coronary blood flow, and reduced the cononary arteriovenous oxygen difference, which is indicative of a reduced rate of oxygen extraction by the myocardium against the background of an increased myocardial oxygen demand. The reduction of the oxygen extraction correlates with the increased COHb level. Inhaled CO lowers the threshold of angina pectoris due to the reduced myocardial oxygen tension. Also, considerable reduction of the oxygen diffusion from the capillaries toward the mitochondria due to the combination of CO with myoglobin is observed. Chronically increased CO levels in the blood and tissues not only accelerate the development of arteriosclerosis, but also induce a process directly injurious for the myocardial metabolism.

48308 **APTIC NO. 75031**

Schlipkoeter, H. W., Georg D. Fodar, Friederich Pott, Michael Wagner, and Gerhard Winneke

INQUIRY INVESTIGATION OF ENVIRONMENTAL POLLUTION AND DAMAGE DUE TO VEHICULAR TRAFFIC IN URBAN AREAS -- NOISE AND POLLUTANTS. PART II. *2: INVESTIGATION OF THE PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF AUTOMOBILE EXHAUST GASES ON THE URBAN POPULATION. (EG-Enquete Untersuchung der Umweltbelaestigung und Umweltschaedigung durch den Strassenverkehr in Stadtgebieten -- Laerm und Abgase). Assoc. of German Engineers (West Germany), Commission for Noise Abatement and Commission for Purification of the Atmosphere, 203p., 1974. 254 refs. Translated from German, 168p.*

The relationships between exhaust gas pollution from motor vehicles and damages to the health of people living in urban studies and the possible empirically-based parameters of the human capacity for environmental stress are discussed. The inorganic and organic components of automobile exhaust and their sources are described. Health damage due to automobile exhaust is discussed, and a basis for determining the maximum allowable ground level emission of these pollutants is described. Then the specific components or groups of components of automobile exhaust are discussed, including their effects on man and animals and the results of experimental studies on those effects. Carbon monoxide, nitrogen oxides, lead, and oxidants are discussed in detail. Hydrocarbon effects are discussed in an appendix. The following individual hydrocarbons or groups of hydrocarbons with proposed ground level emission limiting values are discussed: paraffins, naphthenes, olefins and alkenes, benzene-type aromatic hydrocarbons, benzene, benzo(a)pyrene, and oxygenated hydrocarbons.

48309 **APTIC NO. 69652**

Schwing, Richard C. and Gary C. McDonald

MEASURES OF ASSOCIATION OF SOME AIR POLLUTANTS, NATURAL IONIZING RADIATION AND CIGARETTE SMOKING WITH MORTALITY RATES. *General Motors Corp., Warren, Mich., Mathematics Dept. and Societal Analysis Dept., Rept. GMR-1573, 38p., June 24, 1974. 28 refs. (Presented at the International Symposium on Recent Advances in the Assessment of the Health Effects of Environmental Pollution, Paris, France, June 24-28, 1974.)*

Two methods were used to estimate the association of hydrocarbons, sulfur compounds, nitrogen compounds, natural ionizing radiation, and cigarette smoking with some age stratified and disease specific U. S. mortality rates for white males. The first method was based on a ridge regression technique and the second on a sign constrained least squares analysis. The measure of association between these environmental factors and mortality were quantified as elasticities; i.e., the indicated percentage change in the average mortality rate corresponding to a 1% change in the average level of the environmental factor. Elasticities were estimated for age specific and disease specific mortality rates, including lung cancer rates and arteriosclerotic heart and coronary rates, and these values were then aggregated and compared to estimates corresponding to total mortality rates. Overall, consistent results were obtained using the above methods for sulfur compounds and cigraette smoking. Many of the results differed considerably from corresponding results obtained from the ordinary least squares regression analysis, highlighting the need for applying the appropriate estimation methods. In addition to the variables already specified, the analyses took into consideration the following groups of explanatory variables: climatic variables (precipitation, January temperature, July temperature, humidity, and solar radiation) and socio-economic variables (age, education, sound housing, population per household, population density, %nonwhite, % white-collar, income, and city size).

48310 **APTIC NO. 69204**

Serizawa, Sachiko

AIR POLLUTION AND CHILDREN S COLD (REPORT NO. 2). *(Taiki osen to kodomo no kaze shojo, dai-2-ho). Text in Japanese. Preprint, All Japan Democratic Medical Union, p. 37, 1974. (Presented at the All Japan Democratic Medical Union, Scientific Meeting, 2nd, Sendai, Japan, Oct. 26-27, 1974.)*

There has not been much study done on the effects of air pollution in the respiratory system of children. With the cooporation of teachers from 15 nursery schools in Osaka, the symptoms of children s cold and the concentrations of sulfur dioxide and nitrogen dioxide were studied between Nov. 1972 and Feb. 1973. Close relationships were noted between daily, weekly, and monthly morbidities and the pollution levels. The examinations involved 30,357 children were 1-3 years old and 140 infants wery studied continuously. The annual morbidity rate was 42%. Monthly morbidity averages and the monthly averages of NO2 and SO2 from the data of the Osaka Prefectural Monitoring Centers were closely related. At nurseries where more than 20 infants could be observed, their morbidity and the nearest monitoring station measurements were examined. At nursery schools where SO2 and NO2 were both high, close correlations with infant morbidity were noted. Twenty-six weeks were found where SO2 levels did not exceed the environmental standards at two nursery schools, and the week averages for SO2 and morbidity were studied. A clear correlation was noted; and by regression analyses, it was discovered that morbidity was affected not only by the NO2 but also by the SO2 concentration below the environmental standard. It suggested that the government SO2 standard was not quite appropriate for infants.

48311 **APTIC NO. 69645**

Shy, Carl M., Victor Hasselblad, John F. Finklea, Robert M. Burton, Mimi Pravda, Robert S. Chapman, and Arlan A. Cohen

VENTILATORY FUNCTION IN SCHOOL CHILDREN: 1970-1971 NEW YORK STUDIES. *In: Health Consequences of Sulfur Oxides: A Report from CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/1-74-004, p. 5-109 to 5-119, May 1974. 14 refs.*

NTIS: PB 234 920/AS

Ventilatory function (forced expiratory volume 0.75) tests were performed on 2364 New York metropolitan elementary school children four times during the 1970-1971 school year. Older white children, aged 9 to 13 years, from a relatively unpolluted suburban fringe community on Long Island had significantly better ventilatory function than children from two more polluted urban communities. This difference existed in the face of recent improvements in air quality. Older children exposed for more than 8 years to annual average sulfur dioxide levels estimated at 131 to 435 micrograms/cu m, accompanied by levels of suspended particulates estimated at 75 to 200 micrograms/cu m and suspended sulfates estimated at 5 to 25 micrograms/cu m, showed significant decreases in FEV 0.75; but younger children, aged 5 to 8 years, did not. The effects of suspended nitrates and the soiling index were also noted. The effects of age, height, socio-economic differences, sex, ethnic factors, migration, ambient temperature, exposure to indoor air pollutants and to pollutants not monitored, and concurrent acute respiratory disease were all considered. (Author summary modified)

48312 **APTIC NO. 69646**

Shy, Carl M., Cornelius J. Nelson, Ferris B. Benson, Wilson B. Riggan, Vaun A. Newill, and Robert S. Chapman

VENTILATORY FUNCTION IN SCHOOL CHILDREN: 1967-1968 TESTING IN CINCINNATI NEIGHBORHOODS. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, EPA-650/1-74-004, p. 6-1 to 6-14, May 1974. 24 refs.*

NTIS: PB 234 920/AS

Ventilatory performance, measured as forced expiratory volume 0.75 (FEV 0.75), of white children residing in a moderately polluted industrial valley of Cincinnati was significantly lower than the performance of white children living in a clean area of the metropolitan region. Areas were matched for socio-economic and racial characteristics. Tests were performed once weekly for a month during three different seasons of the shool year. Area differences in test results were greatest during the winter when pollution levels were highest in all sectors. Socio-economic level had an influence on the ventilatory performance of white children, but black children of both exposure areas had the lowest results. Pollution had no consistent area effect on the performance of the black children. In none of the study sectors were test results significantly associated with pollution concentrations during the 24 or 4 hr immediately preceding the tests. Concentrations of total suspended particulates, suspended sulfates and nitrates, soiling index, and sulfur dioxide were measured daily adjacent to all schools in the six study sectors. Indoor and outdoor concentrations were monitored at one school in each study sector. The 7-month arithmetic mean SO2 level was less than 52 micrograms/cu m. Levels of total suspended particulates were 76-131 micrograms/cu m in polluted sectors and 61-92 micrograms/cu m in clean sectors. The average suspended sulfate levels were 9.5 and 8.3 micrograms/cu m in the polluted and clean sectors, respectively. The average suspended nitrate levels were 3.1 and 2.4 micrograms/cu m, respectively, in white sectors. Since SO2 levels were low in all areas, observed area differences in FEV 0.75 were probably attributable to differences in either total supended particulates, suspended sulfate, or nitrate exposure. The observed area effect of FEV 0.75 was probably due to suspended sulfates. (Author summary modified)

48313 **APTIC NO. 69409**

Stara, J. F., W. Moore, and A. W. Breidenbach

TOXICOLOGY OF ATMOSPHERIC POLLUTANTS RESULTING FROM EMISSIONS ASSOCIATED WITH THE USE OF AUTOMOBILE CATALYTIC CONVERTERS. *Preprint, 21p., 1974. 8 refs. (Presented at the International Symposium on Recent Advances in the Assessment of Health Effect of Environmental Pollution, Paris, France, June 24-28, 1974.)*

A definitive toxicologic investigative approach is described used for testing automotive emissions, fuel additives, and emission components related to the catalytic converter emission control system. A matrix for investigating the toxicology of individual pollutants and emissions from mobile sources was used to determine the potential toxic effects. The presented data are illustrations of the response of selected animal models to the catalyst treated exhaust and to individual components such as platinum and palladium. The biological parameters studied were markedly influenced by the use of the converter. Three types of investigations were conducted: short-term acute exposure experiments, subacute exposure experiments of longer duration at lower levels, and chronic long term exposures conducted at realistic environmental levels. Inhalation exposure systems were developed for animal exposure tests. Two engines equipped with catalytic converters were installed in the laboratory to conduct subacute and chronic inhalation studies of the emissions with and without catalyst. The effects of catalyst control systems on various emission components were studied. Animal tests were also conducted using rats and hamsters to determine effects of catalytic treated irradiated exhaust, catalytic treated nonirradiated exhaust, irradiated exhaust, nonirradiated exhaust, carbon monoxide control atmosphere, and filtered air control atmosphere. The biological effects of individual components of catalytic converter emissions such as palladium and platinum were also studied. Major experimental methods and results of these studies are reviewed. (Author abstract modified)

48314 **APTIC NO. 683[illegible]**

Suzuki, Tsuguyoshi and Sachiko Shishido

CHANGE OF LEVELS OF URINARY ORGANIC MERCURY IN GROUPS WITH VARYING EXTENTS OF INORGANIC MERCURY EXPOSURE. *Tohoku J. Exp. Med. Tokyo, 112(1):101-102, 1974. 2 refs.*

The level of urinary organic mercury was compared among groups with varying extents of inorganic mercury exposure, including laboratory workers with occasional Hg vapor exposure, college students, staffs of a university, and workers exposed to Hg vapor. The level of urinary organic mercury increased with increased urinary inorganic mercury. This suggested three possibilities: the methylation of inorganic mercury may occur, though slight in extent, in the human body; methyl mercury accumulated by the background exposure and bound to the binding site of tissues may be exchanged by inorganic mercury: and the elevation of urinary organic mercury may be only a contingency due to the error of measurements. (Author abstract modified)

48315 **APTIC NO. 68[illegible]**

Sweet, Doris V., William E. Crouse, John V. Crable, John R. Carlberg, and William S. Lainhart

THE RELATIONSHIP OF TOTAL DUST, FREE SILICA, AND TRACE METAL CONCENTRATIONS TO THE OCCUPATIONAL RESPIRATORY DISEASE OF BITUMINOUS COAL MINERS. *Amer. Ind. Hyg., Assoc. J., 35(8):479-488, Aug. 1974. 24 refs.*

A long-range study of lung tissue from deceased bituminous coal miners is discussed. A follow-up study of 19 miners and 15 female residents of the representative mining communities, as controls, is also presented. The tissues were analyzed for total dust, coal, free silica, ten trace elements, and hydroxyproline. Data from 64 cases reported earlier were pooled with this information for statistical studies. The following factors were considered: duration of mining experience, period from retirement to death, severity of respiratory disease, and levels of dust exposure (by job classification). Smoking history was not included, since the number of nonsmokers in the sample was statistically not significant. Observed amounts of total dust, coal dust, free silica, chromium, iron, nickel, titanium, and vanadium in the miners lungs appeared in markedly higher concentrations than in the controls. When the miners lung cases were classified according to degree of tissue damage from pneumoconiosis, increasing degrees of lung damage correlated with increasing amounts of magnesium, beryllium, vanadium, free silica, coal dust, and total dust. (Author abstract modified)

48316 **APTIC NO. 69247**

Tanaka, K., H. Yamagata, R. Endo, H. Naito, J. Nomura, and T. Tanabe

ON THY LEAD CONTENT OF BLOOD OF POLICEMEN ON OUTSIDE DUTY. *(Gaikin keisatsukan no kecchu enryo ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):367, Oct. 1974. (Presented at the Japan Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 481.)*

The blood lead content of policemen on outdoor assignments and their general health status can be used as an index of the effect of exposure to auto exhaust. Subjective symptoms, urine protein, urine sugar, urobilinogen, lead in blood, hemoglobin, hematocrit, serum protein, A/G ratio, blood sugar, transaminase, alkaline phosphatase, cholesterol, ureaform nitrogen, and Kunkel s reaction were determined on 919 policemen and women on outside duty. The frequencies of physical, mental, and nervous syndromes were respectively 20.9, 24.6 and 15.5%. There was no difference of lead in blood with age, 11.38 + or - 4.93 micrograms/dl, but was higher in men than in women. The lead in blood was higher in those who showed a normal value hematocrit than those showing a lower than normal hematocrit value. No health impairment of policemen on outside duties due to auto exhaust was found, and their blood lead was nearly the same as that of healthy persons in the Prefecture.

48317 **APTIC NO. 68668**

Tsuchiya, Kenzaburo

ENVIRONMENT AND HEALTH EVALUATION. *(Kankyo to kenko hyoka). Text in Japanese. Nippon Ishikai Zasshi (J. Japan Med. Assoc.), 72(2):205-215, July 1974.*

Human health is a function of hereditary factors and total environment. The concepts of environment and health evaluation, health spectrum, and survival are discussed. The relationship between environment and biological processes is discussed taking the case of lead poisoning as an example. The physiology of lead poisoning and susceptibility to lead poisoning are described with case studies. The lead and cadmium levels in blood and urine are discussed as indicators. The mercury level in urine is a good indicator for inorganic mercury compounds, though organic mercury compounds are not detectable in urine. The subjects of environmental background concentration of heavy metals, biologic response, permissible amount, difficulty in environmental evaluation, biological half time, organic mercury content in food, accumulation of cadmium in the human body, and problems in measurement methods are also discussed.

48318 **APTIC NO. 68350**

Wagner, J. C., G. Berry, J. W. Skidmore, and V. Timbrell

THE EFFECTS OF THE INHALATION OF ASBESTOS IN RATS. *Brit. J. Cancer (London), vol. 29:252-269, 1974. 23 refs.*

Caesarean derived Wistar rats were exposed to dust clouds of five standard asbestos reference samples in inhalation chambers for periods of 1 day, 3 months, 6 months, 12 months, and 24 months in order to establish a relationship between the development of malignant lung tumors and the dose and type of asbestos dust inhaled. All of the asbestos samples produced asbestosis which continued to progress after removal from exposure; unexposed control rats showed only a little fibrosis. Lung tumors, ranging in severity from adenomata to squamous carcinomata, were produced by all asbestos samples; only a few adenomata and none of the more serious tumors were observed in controls. Exposure to either of two chrysotile samples resulted in the occurrence of 16 metastases out of 20 tumors which metastasized. A total of 11 mesotheliomata occurred, four of which were crocidolite and four with Canadian chrysotile. Two mesotheliomata occurred with only a 1-day exposure as compared to only one mesotheliomata after a 3-month exposure, the probability of such an occurrence being 0.002, assuming that mesotheliomata incidence is proportional to dose. Asbestosis and the occurrence of lung tumors were positively associated. (Author abstract modified)

48319 **APTIC NO. 69424**

Waller, R. D., A. G. F. Brooks, and M. W. Adler

RESPIRATORY, SYMPTOMS AND VENTILATORY CAPACITY IN A COHORT OF LONDONERS BORN IN 1952-3. *Preprint, Council of European Communities, Environmental Protection Agency, Washington, D. C., World Health Organization, Geneva, Switzerland, 13p., 1974. 13 refs. (Presented at the Environment and Health International Symposium, Paris, France, June 1974, Paper 4.)*

Ventilatory capacity measurements and respiratory symptom questionnaires were used to compare 800 Londoners (age 18 in 1970) exposed during their neonatal period to high pollutant concentrations during the London fog of 1952 with 800 subjects (age 18 in 1971) not exposed to the 1952 episode. Neither prevalence of respiratory symptoms nor respiratory function measurements showed differences between the two groups. Respiratory symptoms were much more common among smokers than non-smokers, with small differences in ventilatory capacity appearing between these categories. The main factor associated with lowered ventilatory capacity was a history of respiratory illness. The retrospective information on childhood illnesses was not adequate to substantiate possible indirect long-term effects of pollution exposure to respiratory illness history.

48320 **APTIC NO. 68509**

Warner, Peter O. and Lazier Stevens

REEVALUATION OF EPIDEMIOLOGICAL HEALTH EFFECTS FORMERLY ATTRIBUTED TO MEASURED LEVELS OF NITROGEN DIOXIDE IN VIEW OF SYNERGISTIC EFFECTS DUE TO COPOLLUTANTS. *Preprint, 11p., 1974. 7 refs. (Presented at the International Symposium on Recent Advances in the Assessment of the Health Effects of Environmental Pollution, Paris, France, June 24-28, 1974.)*

Data are presented to show the presence of a number of biologically antagonistic air contaminants other than nitrogen dioxide in an area of Chattanooga, Tennessee near an army ammunition plant which was previously designated for a single- pollutant (NO2) related population study among families residing in the areas of the Greater Chattanooga School District. A summary report of air pollution evaluations prepared by the Army Environmental Hygiene Agency indicates that a boiler plant adjacent the ammunitions plant produces the following non-NO2 emissions: sulfuric and nitric acid mists, sulfur dioxide, and particulates. Sulfation rates for the area as measured by the Department of Health, Education, and Welfare indicate low but measurable sulfation in the range of 0.1-1.2 mg sulfur trioxide/100 sq cm/day. Other findings show high levels of suspended sulfate in the NO2 area which vary from 11.2-20.7 micrograms/cu m. The evidence indicates that, in addition to NO2 emissions, there are significant quantities of other pollutants on a scale which precludes the assumption that the study area represents an environment in observed respiratory symptoms may be related exclusively to NO2.

48321 **APTIC NO. 69755**

Warren, Harry V.

ENVIRONMENTAL LEAD: A SURVEY OF ITS POSSIBLE PHYSIOLOGICAL SIGNIFICANCE. *J. Biosocial Sci., 6(2):223-238, 1974. 49 refs.*

Sources of environmental lead are discussed in a survey of diseases of the nervous system. Only 5-10% of the Pb ingested in food and water is absorbed, while 40-50% of the Pb present in inhaled air is absorbed. Air, dust, and leaded gasoline are among the sources of Pb. Normal rural air in the United States may contain 0.05 micrograms of Pb/cu m, while 0.3-2.5 may be representative of general urban areas. An urban dweller can inhale daily 60-120 micrograms of Pb, but it is not known whether 25 or 50% of this Pb is absorbed. Urban dusts in Vancouver seldom run less than 200 ppm with many downtown samples carrying more than 1%. Values from 0.5 to 6% Pb in dust are common in many large cities in Great Britain, Canada, and the United States. Evidence exists in the United States and Great Britain to show the significance of atmosphere and vegetative pollution by tetraethyl Pb discharged in the exhaust fumes of motor vehicles. The Pb from leaded gasoline not only is a major contribution to the Pb occurring in urban air and dust but also adds indirectly, and significantly, to the Pb content of the food grown in some localities. Many diseases of the nervous system as multiple sclerosis, swayback, kuru, motor neurone disease, and amyotrophic lateral sclerosis frequently have an unexplained association with Pb or mercury. (Author abstract modified)

48322 **APTIC NO. 69598**

Yabroff, I., E. Myers, V. Fend, N. David, M. Robertson, R. Wright, and R. Braun

THE ROLE OF ATMOSPHERIC CARBON MONOXIDE IN VEHICLE ACCIDENTS (FINAL REPORT). *Standard Research Inst., Menlo Park, Calif., Coordinating Research Council Contract CRC-ARPAC, Proj. CAPM-12-69, 103p., Feb. 1974. 78 refs.*

A literature search was performed to determine the degree to which atmospheric carbon monoxide occurring in the heavy traffic of urban trafficways is a contributing factor to vehicle accidents. Attempts to relate high levels of atmospheric CO or blood carboxyhemoglobin to accidents suggests that driver fatalities do have higher levels of COHb (independent of the fact that they also have higher alcohol levels) than do drivers not involved in accidents, though the degree to which this is due to smoking rather than atmospheric CO absorption is not known. An experimental plan consisting of an initial, low cost correlation analysis using available atmospheric CO data in specified urban centers and police accident records is described by which the degree of atmospheric CO contribution to vehicle accidents can be established more firmly. (Author abstract modified)

48323 **APTIC NO. 70268**

Yasuga, Noboru, Naoto Yamamoto, Nobuko Yamamoto, and Mieko Kawasaki

INVESTIGATION OF IMMEDIATE CAUSES OF OFFICIALLY RECOGNIZED POLLUTION VICTIMS DEATHS. *(Kogai nintei kanja no chokusetsu shiin no kento). Text in Japanese. Preprint, All Japan Democratic Medical Union, p. 38, 1974. (Presented at the All Japan Democratic Medical Union, Scietific Meeting, 2nd, Sendai, Japan, Oct. 26-27, 1974.)*

The immediate causes of obstructive respiratory diseases are suffocation and the incomplete functioning of the heart caused by lung obstruction. But there have been too many unexpected heart attacks that should not be included in the same category as incomplete functioning of the heart. The sudden heart failures, in many cases, can be remedied by immediate and appropriate treatment. After Sakai was designated as a heavily polluted area, three officially recognized air pollution victims died in the hospital. All three cases involved sudden, unexpected heart failures, and in each case the patient was revived successfully by immediate treatment. There were seven sudden heart failures among the three before they died. The actual causes of such sudden heart failures and treatment methods must be studied further.

48324 **APTIC NO. 68502**

Yokohashi, Goro

DYNAMICS OF CADMIUM FROM A HUMAN BIOLOGICAL POINT OF VIEW. *(Seitai o chushin to shita kadomiumu no dainamikkusu). Text in Japanese. Tokyo Igaku (Tokyo J. Med. Sci.), 82(3):183-196, June 1974. 29 refs.*

According to the 1969 data of the air pollution monitoring networks of nine cities in Japan, the 24-hour cadmium concentration annual averages ranged from 0.009 and 0.033 micrograms/cu m, and the mean figure was about 0.02 micrograms/cu m. Most of CD accumulation in the human body comes through food intake. But it also comes from inhalation of the air and cigarette smoke. The adult capacity for inhalation of the air per day is about 15 cu m, and thhe Cd lung inhalation is 0.3 micrograms. Some cigarette smoke contains as much as 5.8 micrograms/20 cigarettes, and a minimum of 2.7 micrograms/20, with the average of 4 micrograms/20. An average smoker of 20 cigarettes a day is inhaling about 4 micrograms of Cd daily into his lungs. By animal experiments, the respiratory absorption rate of inhaled material is known to be 10-30%. Since Cd particles are small, the absorption rate is 30%, and an adult smoker smoking 20 cigarettes a day is probably absorbing 0.1 micrograms from the atmosphere, and 1.2 micrograms/day from cigarettes. Including the amount taken in through food, water, air, and cigarettes, a normal smoker is absorbing 3.9-4 micrograms of Cd a day, a nonsmoker about 2.7 microgram a day. The Cd accumulation in the adult body is not transmitted to a fetus, and a newborn baby is presumably free of any Cd. But Cd accumulates in kidney and cortex with the age, reaching a peak in persons 50-60 years old; the accumulation is proportionate to the age in the liver. The Cd accumulation in a 50-year-old in the kidney is about 18 mg. Mathematical models are presented.

48325 **APTIC NO. 70055**

Zaugolnikov, S. D., A. V. Kuznetsov, O. G. Matveyev, and G. D. Suntsov

EFFECTIVENESS OF ORGANOPHOSPHORUS COMPLEXONS IN INTRACHEAL POISONING WITH BERYLLIUM CHLORIDE. *(Effektivnost fosfororganicheskikh kompleksonov pri intratrakheal nom otravlenii khloristym berilliyem). Farmakol. i Toksikol. (Moscow), vol. 37:239-242, March-April 1974. 9 refs. Translated from Russian, 6p.*

Experiments conducted on 340 mice and 170 rats gave evidence that the organophosphorus complexon DTPP (calcium-sodium salt of diethylenetriaminepentamethylphosphonic acid), by single intraperitoneal administration, greatly mitigates pulmonary edema, provoked by intratracheal administration of beryllium chloride, and increases survival of the animals. Radioisotope investigations demonstrated that DTPP contributes to more rapid elimination of the beryllium ion from the body in cases of intratracheal poisoning with beryllium chloride.

48326 **APTIC NO. 69283**

Kyoto Municipal Government (Japan), Dept. of Environmental Pollution Control

THE EFFECT OF MOTOR TRAFFIC ON THE HEALTH OF RESIDENTS ALONG ROADS. *(Endo jumin no kenko ni oyobosu jidosha kotsu no eikyo). Text in Japanese. In: Kyoto-shi Kogai Ekigaku Kenkyu Hokoku (The Epidemiological Research Report on Environmental Pollution in Kyoto City). p. 24-51, March 1974.*

A number of questionnaire investigations were conducted between 1967 and 1972 to see the effects of traffic and carbon monoxide in the air. They involved 19,911 first graders, 13,814 seven-month pregnant women, two-year-olds and their mothers, housewives from 593 families along roads, 21 traffic policemen, 84 patrol policemen, 37 police office workers, 63 women police traffic guides, and 26 women office workers. They were asked questions concerning eye symptoms, respiratory symptoms, symptoms indicating carbon monoxide poisoning , general health symptoms, psychological symptoms, and general complaints about traffic pollution. For schoolchildren, sensitivity of the skin, susceptibility to rash, and compaints about itchiness were 1.6-1.3 times higher along heavily used roads than away from traffic. Also, susceptibility to colds, stuffed nose, throat pain and swelling, coughs, and prolonged colds were 1.3 to 1.2 times more frequent for the children who lived along heavily trafficked roads. For two-year- olds, all the symptoms such as sleep disturbances, temper tantrum, no appetite, vomiting, rash, diarrhea, cold, biting, striking, tonsilitis, and all showing emotional or physical instability were 1.8-1.2 times higher for families along traffic roads than those away from roads. The psychological, emotional, and physical instabilities for pregnant women along roads were 1.5-1.3 times higher than those away from roads. The morbidity for chronic bronchitis for housewives living along traffic road was more than twice that for housewives living in areas with a light sulfur oxides level, and 1.7 to 1.4 times that for those living in high SOx level areas. The traffic police had 1.6 to 2.1 times more symptoms of CO poisoning, digestive irregularity, and fatigue than office policemen. For women police, those symptoms were also 1.8 to 1.6 times higher than for regular office workers.

48327 **APTIC NO. 69548**

Copley International Corp., La Jolla, Calif.

EFFECTS OF OXIDANT LEVELS ON SELECTED HEALTH CHARACTERISTICS OF PERSONS IN THE LOS ANGELES BASIN. SECOND ANNUAL REPORT, VOLUME I: DATA COLLECTION. *Environmental Protection Agency Contract 68-02-0349 and Coordinating Research Council, Inc., Contract CAPM-11-71, 52p., June 7, 1974.*

NTIS: PB-234 337

Epidemiologic studies on the effects of oxidant levels on selected health characteristics of persons in the Los Angeles Basin were conducted. The studies are part of the nationwide Community Health and Environmental Surveillance (CHESS) program. Individual studies included: prevalence of chronic respiratory disease; incidence of acute respiratory diseases; pulmonary function in children; frequency of asthma attacks; incidence of irritative symptoms during acute episodes; and pollutant burden of trace metals. The data collection tasks are described, and the data are tabulated.

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48328 **APTIC NO. 70061**

Aronova, A. V.

CERTAIN TRACE ELEMENTS IN EXPERIMENTAL MYOCARDIAL INFARCTION AGAINST A BACKGROUND OF HYPERTENSION AND ATHEROSCLEROSIS. *(Nekotorye mikroelementy pri eksperimental nom infarkte miokarda pri nalichii gipertonii i ateroskleroza). Kardiologiya (Moscow), 1973:43-47, July 1973. 21 refs. Translated from Russian, 8p.*

The pathology of trace element metabolism was studied in experimental myocardial infarction. On the basis of data concerning the known effect of prior hypertension and atherosclerosis on the course of myocardial infarction, as well as the frequent combination of these ailments, the question of how the combination of these kinds of pathology affect changes in the content of trace elements in cases of myocardial infarction was studied. Tests were made on two series of rabbits during 5-6 months of observations. During myocardial infarction in the laboratory animals there were serious changes in the content of the trace elements in question in whole blood and tissues. In the acute period of myocardial infarction against a background of hypertension and atherosclerosis, a reduction was noted in the content of zinc, manganese, nickel, and iron, and an increase was noted in the level of copper in the blood. By the start of the scarring processes in the myocardium, the content of Zn, Mn, and Fe in the blood was close to the initial level; the amount of nickel remained reduced; and the level of copper continued to remain high. At this period in the cardiac muscle there was a significant accumulation of iron, an increase in the nickel content, a slight increase in the level of manganese; and the content of copper and zinc within normal limits. In the liver the level of nickel and zinc was reduced; manganese was increased; and zinc and iron were within normal limits. The direction of changes in the content of trace elements in the blood in cases of myocardial infarction were the same with an intact heart as with a background of hypertension and atherosclerosis. However, the more severe shifts in the content of tract elements in organs of animals in the test series indicated that prior hypertension and atherosclerosis aggravate disorders of the metabolism of trace elements during myocardial infarction.

48329 **APTIC NO. 69511**

Astrup, Poul

CARBON MONOXIDE, SMOKING AND ATHEROSCLEROSIS. *Postgrad. Med. J. (London), 49(576):697-706, Oct. 1973. 29 refs.*

Studies on the effects of carbon monoxide and smoking on atherosclerosis are reviewed. Nonsmokers do not run the risk of getting significantly elevated carboxyhemoglobin levels from automobile exhaust in the streets, however, they do run the risk of getting elevated carboxyhemoglobin levels from exposure to CO in closed areas such as garages and tunnels. Carboxyhemoglobin levels up to 20% may also be found in smokers. The central nervous system seems to be influenced by carboxyhemoglobin concentrations up to 20%. The myocardium may also be affected. Experimental work with rabbits exposed to carbon monoxide and cholesterol is described which proved that CO has a damaging effect on arterial walls, leading to increased permeability for various plasma components, to the formation of subendothelial edema, and to increased atheromatosis. The results indicate that the much higher risk of smokers of developing arterial disease in comparison to nonsmokers is mainly due to the inhaled CO in the tobacco smoke and not to nicotine.

48330 **APTIC NO. 70133**

Aviado, Domingo

TOXICITY OF PROPELLANTS. *California Univ., Irvine, Toxic Research Unit, Conf. Environ. Toxicol., Proc. 4th Annu. Fairborn, Ohio, 1973, p. 291-329. 60 refs. (Oct. 16-18, Paper 23.)*

NTIS, DDC: AD 781031

The toxicity of propellants is reviewed including propellants used in aerosols for various personal products such as deodorants and hair spray. The acute inhalational toxicity, chronic inhalational toxicity, acute cardiovascular toxicity, and acute bronchopulmonary toxicity of several low pressure propellants of high toxicity such as trichlorofluoromethane are described based on laboratory tests on guinea pigs, mice, rats, dogs, monkeys, and other laboratory animals. The toxicity of trichlorotrifluoroethane, trichloroethane, and methylene chloride are also discussed. The toxicity of low pressure propellants of intermediate toxicity on various laboratory animals are discussed including the toxicity of dichlorotetrafluoroethane, monochlorodifluoroethane, isobutane, and octafluorocyclobutane. The acute and chronic toxicities of high pressure propellants such as dichlorodifluoromethane, monochlorodifluoromethane, propane, vinyl chloride and of high pressure propellants of low toxicity such as chloropentafluoroethane and difluoroethane are also reviewed. The significance of the pharmacologic action of propellants with regard to cardiac arrhythmia, tachycardia, myocardial depression, hypotension, respiratory minute volume, and pulmonary resistance and compliance are described.

48331 **APTIC NO. 67930**

Ayres, Stephen M., Robert Evans, David Licht, Jane Griesbach, Felicity Reimold, Edward F. Ferrand, and Antoinette Criscitiello

HEALTH EFFECTS OF EXPOSURE TO HIGH CONCENTRATIONS OF AUTOMOTIVE EMISSIONS. STUDIES IN BRIDGE AND TUNNEL WORKERS IN NEW YORK CITY. *Arch. Environ. Health, vol. 27:168-178, Sept. 1973. 20 refs. (Presented at thy American Medical Association, Air Pollution Medical Research Conference, Chicago, Ill., Oct. 3, 1972.)*

On-site and remote health evaluations were performed on 550 bridge and tunnel workers of the Triborough Bridge and Tunnel Authority in New York City to evaluate the health effects of exposure to high concentrations of automotive emissions. Ambient carbon monoxide concentrations averaged 63 ppm over a 30-day period, with a maximum hourly concentration of 217 ppm in one facility. Carboxyhemoglobin saturations in excess of 3% were observed in 85% of the smoking and 47% of the nonsmoking tunnel workers. A high percentage of the group also had symptoms suggestive of chronic bronchitis. Airway resistance was elevated in one-third of the bridge and tunnel workers, and almost all of the workers had an increase in closing volume, suggesting small airway disease. The average blood lead level of all workers was 28 micrograms/100 ml; 7.5% of the workers showed a blood lead concentration in excess of 60 micrograms/100 ml, a level considered by many investigators to be in the toxic range. Hemoglobin concentrations and hematocrit readings were normal in most men. An unexpected and unexplained finding was the abnormality in plasma proteins; 45% of the group had an abnormally high beta-globulin level, while 9% had an abnormally low albumin level.

48332 **APTIC NO. 69448**

Blundi, Edmundo

THE EFFECT OF AIR POLLUTION ON THE RESPIRATORY TRACT. *(Poluicao Atmosferica: acao sobre o aparelho respiratorio). Text in Portuguese. Rev. Brasil Med., 30(9):597-601, Sept. 1973.*

General problems of the effect of air pollution on the respiratory tract are discussed. Air pollution constitutes a major etiological factor in the chronic obstructive diseases of the respiratory tract, and may aggravate preexisting conditions. Notwithstanding, the study of the effect of chronic exposure to air pollution is a complicated problem unsuitable for quantification, unlike the study of the acute effects of high concentrations, e.g., of carbon monoxide. Reduction of the air pollutant concentrations to safe levels, prophylaxis, early diagnosis, and treatment of pulmonary and cardiopulmonary diseases are the principal possibilities available for the control of the harmful effects of air pollution on the respiratory tract.

48333 **APTIC NO. 68428**

Borow, Maxwell, Alfred Conston, Lawrence Livornese, and Norbert Schalet

MESOTHELIOMA FOLLOWING EXPOSURE TO ASBESTOS: A REVIEW OF 72 CASES. *Chest, vol. 64:641-646, Nov. 1973. 25 refs.*

Malignant tumors arising in mesothelial tissue have been so rare that until recently they were considered pathologic curiosities. A high incidence of mesothelioma has recently been found in asbestos workers at an asbestos mill. Since some cases of mesothelioma may have been incorrectly diagnosed, all the autopsy records from 1948 to 1963 at the asbestos mill were reviewed. Only two additional cases of mesothelioma were found. A total of 53 patients among asbestos installation workers plus 19 cases from neighboring hospitals were studied. These 72 cases are reviewed. Fifty-one cases were pleural and 21 were peritoneal mesotheliomas. The patients were exposed to asbestos 20 or more years before the malignancy appeared. Apparently, the incidence of this malignancy is increasing. From 1951 to 1959, there were only four cases. In the first half of the 1960 s, the number of cases averaged one to four per year; in the second half, there was a noticeable increase to eight or nine cases per year. The clinical course, clinical data, and cause of the disease are discussed. Although asbestos bodies have been found in the lungs of nonindustrial workers living in major industrial areas, the number is a small fraction of the number found in the lungs of persons who were occupationally exposed to asbestos. At present there does not seem to be any health hazard for the general public.

48334 **APTIC NO. 69803**

Crocker, T. Timothy

IN VITRO METHODS FOR ASSESSMENT OF TOXICITY AND CARCINOGENICITY. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 199-210. (Oct. 16-18, Paper 15.)*

NTIS, DDC: AD 781031

The state of knowledge of the application of isolated mammalian organs or cells to questions in cell biology, genetics, mutagenesis, teratogenesis, and carcinogenesis is advanced enough to recommend that such systems be developed for use in evaluating toxic and carcinogenic effects of environmental chemicals. These systems are useful in short-term studies and should be used in parallel with studies of intact animals where possible in order to build a framework of comparative data with which to judge the relative sensitivity, cost, and utility of in vitro systems. Some of these in vitro test systems for assessment of toxicity and carcinogenicity are reviewed. Cell cultures have been applied to a large range of critical biological systems. Epithelial cells are the first cells to be hit upon exposure to environmental chemicals and are the major cell types which metabolize, detoxify, and excrete environmental chemicals. Problems arising from the use of epithelial cells compared with fibroblastic cells were illustrated by a series of experiments in which an attempt was made to isolate epithelial cells separately from connective tissue cells of mice trachea. Identity of cell type in cell culture is a problem that is not encountered in organ cultures. This in vitro method has been used for studies of toxic and carcinogenic materials of environmental origin. Organ cultures were done of rodent, simian, and human tracheobronchial structures in order to compare responses of epithelia of these organs to comparable concentrations of polycyclic hydrocarbons under comparable conditions of organ culture. Hamster observations on carcinogenesis in the respiratory epithelium were relevant to human respiratory carcinogenesis by benzo(a)pyrene. While in vitro methods cannot at this time replace animal studies, they do permit some comparisons between animal and human tissues.

48335 **APTIC NO. 69810**

Darmer, Kenneth I., Jr. and James D. MacEwen

MONOMETHYLHYDRAZINE - CHRONIC LOW LEVEL EXPOSURES AND 24-HOUR EMERGENCY EXPOSURE LIMITS. *California Univ., Irvine, Toxic Hazards Research Univ., Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 373-385. 14 refs. (Oct. 16-18, Paper 27.)*

NTIS, DDC: AD 781031

Monomethylhydrazine (MMH) is a highly reactive chemical which has been increasingly used as a rocket fuel component during the last decade. Chronic exposures to MMH were studied by continuous exposures on rats, dogs, and monkeys. Hematocrit, hemoglobin, red blood cell, white blood cell, total inorganic phosphorus, alkaline phosphatase, reticulocyte, Heinz body, body weight (rats also), red blood cell fragility (dogs only), and gross histopathology measurements were conducted on monkeys and dogs. The continuous 90-day exposure of animals to an atmospheric concentration of 0.1 produced measurable effects in dogs and rats. Rat growth rate was depressed; the difference between the exposed group and the controls was significant at the 0.1 ppm level until the last weighing period. Rat hematology values were slightly lower in both exposure groups, suggesting some hemolytic effect. This change was statistically significant after 45 days of exposure, but was not significant at 90 days, although still present. Gross pathology examinations conducted on rats failed to show any significant differences. Beagles showed significant increases in serum phosphorus and alkaline phosphatase levels during exposure. Hematologic changes occurred only at the 0.1 ppm concentration. The red blood cells of the dogs exposed at the 0.1 ppm level demonstrated increased osmotic fragility compared to controls. No significant change occurred at the 0.04 ppm level. Gross pathologic changes were observed at the highest concentration (0.1 ppm) only in dogs. There were no gross differences between control and MMH-exposed monkeys. It appeared that 0.04 ppm MMH would be a safe threshold limit value for continuous exposure in confined working areas. Since no significant changes were observed in animals exposed to 1 ppm MMH for 24 hr, this level was probably a safe concentration and was proposed as the tentative 24-hour Emergency Exposure Limit.

48336 **APTIC NO. 67161**

Davies, C. N.

THE DEPOSITION OF AEROSOL IN THE HUMAN LUNG. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 90-99. 46 refs. (Oct. 17-18.)*

The deposition of airborne aerosols in the human lung during steady breathing is discussed. Recent experiments show that the deposition can be as low as 10-15% for particles in the size range 0.5-1.0 micron diameter. There is practically no difference between the deposition of 0.5 micron and 1.0 micron particles during steady breathing. Sedimentation is responsible for deposition upon the alveolar wall, but is is not the rate determining factor. The mechanical mixing of tidal and reserve air in the 200 cu cm of dead space is responsible. Particles of extreme shape such as asbestos fibers and hygroscopic particles like tobacco smoke are health hazards. The coarser types of asbestos fibers are responsible for bronchial carcinoma and asbestosis, which do not require penetration of asbestos fibers to the alveoli. If particles of smoke of 0.2 to 0.5 micron size are inhaled and increase in size to 2 or 3 micron diameter by absorbing moisture while in the lung airways, they will readily deposit on the bronchial epithelium and present the risk of bronchial carcinoma.

48337 **APTIC NO. 70052**

Ehling, U. H.

MUTAGENICITY TEST OF FOREIGN SUBSTANCES. *(Mutagenitaetspruefung von Fremdstoffen). Schrytenreihe Ver. Wasser-Boden.-Lufthyg. (Berlin), vol. 40:21-37, 1973. 68 refs. Translated from German, 27p.*

The mutagenicity of foreign chemical substances is reviewed and discussed. Tests for mutagenicity are described. Mutagenicity tests of foreign substances would be easier if it were possible to identify a network of simple test systems which makes possible greater feasibility of evidence of the mutagen effect of these agents in mammals. Extrapolation is difficult because mammals have a highly developed system for the metabolization and detoxification of foreign substances. Test arrangements for mutagenicity in mammals are discussed. Genetic hazards from foreign substances, the effects of carcinogens on mutagenicity, and toxic tolerances are also discussed. Examples of various mutagenicity tests are given.

48338 **APTIC NO. 67571**

Endo, R., M. Umeda, K. Takemoto, and K. Namie

INFLUENCE OF AIR POLLUTION OF BIRD RESPIRATORY ORGAN (2) EFFECT OF CARCINOGENIC HYDROCARBON ON QUAIL LUNG. *(Taiki osen no tori kokyuki ni oyobosu eikyo (2) gangen-sei tanka suiso no uzura hai ni oyobosu eikyo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):138. April 1973.*

After transairway-intrapulmonary infusion of carbon powder (C), methylcholanthrene (MC), and C+MC into quails, the residual barium sulfate in lungs was investigated and the existence of barium sulfate even after 1 mo was found. In MC group, exudative inflammation was found in all cases one day after the infusion. After three days epithelial hyperplasia appeared but after 1 wk this phenomena began to decrease. In the C+MC group, epithelial proliferative change began after 20 days and heterotopy as well as homogeneity were continuously changing after 45 days.

48339 **APTIC NO. 69805**

Goldstein, E., W. Lippert, and D. Warshauer

ROLE OF THE ALVEOLAR MACROPHAGE IN PULMONARY DEFENSE AGAINST BACTERIAL INFECTION. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 221-233. 23 refs. (Oct. 16-18, Paper 17.)*

NTIS, DDC: AD 781031

The initial host-parasite encounter is a critical event in the determination of pulmonary bacterial defense. If the entering microorganisms are killed by host defense mechanisms, or are removed mechanically, the potential infection is averted. If neither of these events occurs, the bacteria may multiply and invade the pulmonary parenchyma. A method for measuring in vivo the rate of bacterial ingestion by alveolar macrophages was studied. The technique consisted of infecting rats with concentrated and finely dispersed aerosols of staphylococci. Sufficient numbers of bacteria were inhaled to allow statistical analysis of the proportion of intracellularly located bacteria at various time intervals after infection. These rates of phagocytic ingestion were then compared in the same animals with simultaneously measured rates of bacterial inactivation. In a second series of experiments, intrapulmonary bacterial inactivation was impaired by exposure to ozone. This gas was chosen because it inhibits pulmonary bacterial killing, and allows bacterial proliferation without altering mucociliary transport rates. The effect of the pollutant on murine rates of bacterial inactivation and ingestion was measured as a means of delineating the mechanisms responsible for the impairment in bacterial defense. Exposure to ozone caused severe defects in the intracellular killing of bacteria and lesser defects in the rate of bacterial ingestion. (Author introduction modified)

48340 **APTIC NO. 68738**

Harris, Curtis C., David G. Kaufman, Michael B. Sporn, Hollis Boren, Frank Jackson, Joseph M. Smith, Judith Pauley, Paul Dedick, and Umberto Saffiotti

LOCALIZATION OF BENZO(A)PYRENE-3H AND ALTERATIONS IN NUCLEAR CHROMATIN CAUSED BY BENZO(A)PYRENE-FERRIC OXIDE IN THE HAMSTER RESPIRATORY EPITHELIUM. *Cancer Res., vol. 33:2842-2848, Nov. 1973. 27 refs.*

The intratracheal instillation of benzo(a)pyrene-ferric oxide in the Syrian golden hamster caused a number of changes in nuclear structure. A selective increase in the cross-sectional area of nuclei of basal cells was observed in multiple focal areas in the tracheal epithelium. This increase represented an enlargement in the cross-sectional area of euchromatin and a dispersion of the heterochromatin. In short-term organ culture of tracheas, incubation with tritiated benzo(a)pyrene (BP-3H) caused labeling of nuclear and cytoplasmic sites in mucous, basal, and ciliated cells. Quantitative light microscopic autoradiography revealed that prior in vivo administration on unlabeled benzo(a)pyrene caused a subsequent increase in the in vitro binding of BP-3H to epithelial cells. The total binding of BP-3H to epithelial cells was inhibited either by the addition of 7,8-benzoflavone to the incubation medium or by incubation at 0 deg. These results suggest that enzymatic activation of benzo(a)pyrene must occur before benzo(a)pyrene can be bound. The nuclear localization of BP-3H was primarily in the heterochromatin, as determined by electron microscopic autoradiography. (Author summary)

48341 **APTIC NO. 64410**

Hata, Shoji

THE PHOTOCHEMICAL SMOG INCIDENT ON JUNE 30, 1973. *(Showa 48 nen 6 gatsu 30 nichi no kokagaku sumoggu). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 6:291-292, 1973.*

The first photochemical smog incident in Shizuoka Prefecture (June 30, 1973) started in Hamamatsu and extended 100 km northeast as far as Fujinomiya city. This not only involved an extraordinarily larg area, but the type of smog was different from that in Tokyo and Osaka. The victims of health damages were all pupils exercising at the time in the playgrounds. In Hamamatsu, 1050 children were involved and complained of eye irritation and pain, throat pain, coughs, and headaches between 2 and 3 pm, but there were no serious effects. The damages to agricultural produce were extensive and 70% of the total rice fields (1656 hectares), and 40 hectares of green scallions were affected. In Shizuoka, 716 children were affected about 5:30 pm, but in Fujinomiya, which is located further northeast, 16 children were affected about 4 pm. The movement of the damages, the locations, the extent of damages, and the direction of the wind, were puzzling in the light of the normal pattern of photochemical smogs, and the pollution sources could not be the coastal industrial area or automobile exhaust gases. The previous day was rainy, and the rain had stopped in early morning. The day was sunny but the visibility was extremely poor; the wind was southerly at 3-4 m/sec. The atmosphere between 500-1500 m altitude was stable. These factors were similar to the usual photochemical smog conditions, but the locations of the cities involved and the wind direction from the sea suggested that the pollution source was the Pacific ocean. Since the wind above 1000 m was northeast, circulation of industrial pollutants by the sea breeze is a possible explanation. The maximum concentration of oxidants was about 0.2 ppm in all areas except for Hamamatsu, where it was a little over 0.2 ppm.

48342 **APTIC NO. 69997**

Haun, Charles C.

CHRONIC INHALATION TOXICITY OF HYDRAZINE. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th Anny., Fairborn, Ohio, 1973, p. 351-363. 11 refs. (Oct. 16-18, Paper 25.)*

NTIS, DDC: AD 781031

A laboratory study of the chronic inhalation toxicity of the rocket fuel hydrazine is described in which four concentration levels were used to compare the effects on four animal species of repeated 6 hr/day, 5 day/wk exposures with continuous exposures of equivalent concentration. The hydrazine doses were 1 ppm continuous for 168 ppm hr/wk, 5.0 ppm intermittent for 150 ppm hr/wk, 1.0 ppm intermittent for 30 ppm hr/wk, and 0.2 ppm continuous for 33.6 ppm hr/wk. The four exposed groups and control group consisted initially of eight male beagle dogs, four female rhesus monkeys, 50 male Sprague-Dawley rats, and 40 female ICR mice. Body weight changes, mortality, blood chemistry, pathological changes, and other symptoms were noted.

48343 **APTIC NO. 69888**

Henschler, Dietrich

CHANGES IN THE ENVIRONMENT--A TOXICOLOGIC PROBLEM. *(Veraenderungen der Umwelt--Toxicologische Probleme). Text in German. Angew. Chem., 85(8):317-326, 1973. 35 refs.*

The toxicity of various air pollutants are discussed. Better methods of recognizing and handling acute poisonings in West Germany are presented. Carcinogenic effects of asbestos and other pollutants are described. Lead, aldehydes, benzene, epoxides, and herbicides have mutagenic properties. Lead, carbon monoxide, mercury, and organic phosphates have neurotoxic effects. Nitrogen oxides, ozone, oxidants, and aldehydes damage lungs. Cadmium is nephrotoxic and hypertensive. Fluoride hardens bones and damages teeth. Problems posed by experiments on animals are discussed. To obtain reliable results, the number of animals must be large enough to show rare effects, the toxic effects must be obvious, and the effects on man and animals must be similar or the same. Negative pollution effects can be avoided by passing restrictive legislation, passing regulations based on quantitative risk estimates, checking toxicologic data periodically, continuing research, making decisions on a broad basis by a broad range of persons, standardizing laboratories, and establishing toxicity standards.

48344 **APTIC NO. 67165**

Heyder, B., L. Armbruster, J. Gebhart, and W. Stahlhofen

DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und*

Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 122-125. 32 refs. (Oct. 17-18.)

The investigation of the deposition of aerosol particles in the human respiratory tract is reviewed. Deposition of monodisperse di-2-ethylhexyl sebacate droplets was determined as a function of the modal droplet diameter and breathing pattern, i.e., tidal volume and frequency of breathing. When the flow rate was constant at 250 cm/sec, the average residence time of the aerosol in the respiratory tract increased from 1 to 8 sec. When the tidal volume was kept constant at 1000 cu cm, the frequency was changed from 30 to 3.7/min. The deposition decreased with increasing flow rate. When the breathing frequency was kept constant at 30/min, and the tidal volume was changed from 250 to 200 cu m, the residence time was constant, but the flow rate of the inhaled aerosol varied by a factor of 4. Changes in the lung geometry with increasing tidal volume had no influence on the deposition of aerosol particles.

48345 **APTIC NO. 69801**

Kinkead, Edwin R.

TOXICITY OF COAL TAR AEROSOL. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 177-188. 6 refs. (Oct. 16-18, Paper 13.)*

NTIS, DDC: AD 781031

Studies on coal tar toxicity are described. Initially, the potential carcinogenicity on skin, pulmonary tissues, liver, and bladder of the volatile materials from coke oven effluents was studied. Animals were continuously exposed for 90 days to aerosolized coal tar at concentrations of 0.2, 2.0, 10, and 20 mg/cu m. Animals included yearling rats, weanling rats, mice, hamsters, and albino rabbits. The most difficult problem in conducting the exposures to coal tar aerosol was the generation of the aerosol itself. The coal tar was diluted with benzene to allow solids to be separated by centrifugation. The benzene was then removed, and the product aerosolized through a specially designed generating device. The aerosol generating device, monthly particle size characteration, exposure methods, and 90-day coal tar aerosol concentrations are described. Toluene-soluble fluorescence in animal tissue was also measured. Three additional experiments were planned using coal tar in which the light oil and solid fractions were retained. The three sequential experiments of 90 days each will use concentrations of 10, 2, and 0.2 mg/cu m. The aerosol exposure portion of the first of these experiments has been completed, and is described. The continuous exposure of animals to coal tar aerosol appeared to stimulate some changes in lung pathology and cause carcinomas of the skin in mice.

48346 **APTIC NO. 70180**

Krakowka, Pawel

EFFECT OF AIR POLLUTION SENSITIZING THE RESPIRATORY SYSTEM. *(Wplyw zanieczyszczen powietrza o dzialaniu uczulajacym na uklad oddechowy). Text in Polish. Pol. Arch. Medy. Wewn., 50(9' 917-922, 1973. 24 refs.*

Allergens which cause respiratory diseases are discussed. Pollens can affect gardeners; butchers, farmers, and furriers are exposed to allergens from animal furs; textile workers are exposed to wool, silk, and feather allergens. Most cases of bronchial asthma are caused by house dust. Millers and bakers are exposed to various allergens contained in flour. Farmer's lung is another allergic respiratory disease. Persons raising birds or poultry can be affected by allergens found in feathers and manure. Brewery workers, mushroom growers, and other workers can suffer from bagassosis, asthma, and other respiratory diseases.

48347 **APTIC NO. 70062**

Krauskopf, J.

PHYTODERMATOSES CAUSED BY CYANOPHYTA AND ALGAE. *(Fytodermatozy zpusobene sinicemi a rasami). Cesk. Dermatol., 48(3):195, June 1973. 1 ref. Translated from Czech., 11p.*

Blue algae, myxophyceae and cyanophyta, may be the cause of toxic or allergic contact dermatitis, and similar algae may cause atopic hypersensitivity. Algae (phycophyta and algophyta) cause symptoms of atopic hypersensitivity after inhalation of the allergen. Cases of allergic contact dermatitis are more rare. Achloric algae of the genus Prototheca are also parasites of man in exceptional circumstances (protothecosis). Exposure to algae can cause itching, vasomotor rhinitis, or mild bronchial asthma.

48348 **APTIC NO. 70047**

Lange, G.

PROBLEMS OF TOXICOLOGICAL TESTING AND EVALUATION OF ENVIRONMENTAL CHEMICALS. *Schrytenreihe Ver. Wasser Boden Lufthyg. (Berlin), vol. 40:12-19, 1973. Translated from German, 15p.*

The problems of toxicological testing and evaluating environmental chemicals are discussed. Environmental chemicals are substances which are brought into the environment by man and can appear in amounts or concentrations which are capable of endangering living creatures, especially man. A substantial sub-group of environmental chemicals are pesticides. Pesticide sub-groups include insecticides, rodenticides, acaricides, vermicides, fungicides, and herbicides. Biocides include pesticides, human and veterinary pharmaceuticals with biocide effects, and food additives with biocide effects. Environmental chemicals can also be divided into the groups of beneficial substances and wastes. Beneficial substances have become necessary in our life for the safeguarding of world nutrition and maintenance of health; they include pesticides, disinfectants, and pharmaceuticals. Wastes can contribute to air or water pollution. Methods for evaluating the toxicity of environmental chemicals are discussed.

48349 **APTIC NO. 67162**

Lippmann, Morton, Roy E. Albert, William M. Foster, Harold T. Peterson, Jr., Jack M. Berger, and Daryl E. Bohning

THE CLEARANCE OF INSOLUBLE PARTICLES FROM THE BRONCHIAL TREE. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 100-112. 46 refs. (Oct. 17-18.)*

The clearance of insoluble particles which deposit on the tracheobronchial trees is discussed. The normal duration of the bronchial clearance phase is a characteristic of each individual and can be anywhere from less than 3 hr to almost 24 hr in a given individual. The duration of clearance is relatively constant over a wide range of particle sizes. The amount of clearance depends on the distribution of the deposition between ciliated and unciliated regions. Cigarettes have a variety of acute and chronic effects on bronchial clearance. A tentative schema for the pathogenesis of obstructive lung disease resulting from cigarette smoke or other inhaled aerosols was developed. The initial response to smoke exposure is an acceleration of mucociliary clearance due to increased mucus production. With continued exposure, the ciliastatic effect of the smoke, and/or the production of an excessive thickness of mucus leads to intermittent or impaired mucous transport, and eventually to the accumulation in and blockage of small airways by viscous mucus.

48350 **APTIC NO. 69809**

MacGregor, Judith A.

THEORETICAL EXAMINATION OF CARBON MONOXIDE KINETICS WITH A COMMENT ON TIME-

WEIGHTED AVERAGE EXPOSURES. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 271-278. 15 refs. (Oct. 16-18, Paper 21.)*

NTIS, DDC: AD 781031

An equation is given for predicting blood carboxyhemoglobin (COHb) levels under a wide range of exposure conditions. It is based on the following assumptions: the gas is absorbed and eliminated solely via the lungs; the substance is inert in the sense that it is not metabolically altered in the body; lung washout time is not significant; there is instantaneous mixing throughout the body compartment; diffusion across the alveoli is rapid; diffusion within the alveoli is rapid, and therefore the concentration of gas at all sites in the lung is the same; the inspiratory and expiratory volumes are assumed to be equal; ventilation is pictured as a continuous process; the pulmonary blood flow is equal to the cardiac output; and the air concentration of the gas is constant. The average deviation between experimental parameters and the predicted and measured COHb levels was 1.84%, using experimental data from Pace s experiment. Using data from controlled CO exposures made by Peterson and Stewart, the equation accurately predicted the level of COHb attained under the conditions tested. Thus, the inert gas equation can predict COHb levels following exposures to 25-2180 ppm CO, for a five-fold increase in ventilation, for smokers and nonsmokers, and for exposures from 15-1440 min in duration. The equation was used to predict COHb levels in situations in which data were limited or completely lacking.

48351 **APTIC NO. 67164**

Maertens, A. and W. Jacobi

IN VIVO DETERMINATION OF THE AEROSOL DEPOSITION IN THE RESPIRATORY TRACT IN ORAL AND NASAL RESPIRATION. *(Die in-vivo-Bestimmung der Aerosolteilchendeposition im Atemtrakt bei Mund- bzw. Nasenatmung). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 117-121. (Oct. 17-18.)*

In vivo determination of the aerosol deposition in the respiratory tract in oral and nasal respiration is described. Water-soluble monodispersed latex spheres were used as aerosol whose concentration was measured by the laser diffraction method in front of the nasal or oral cavity during expiration. In oral respiration, the peremability, i.e., the probability of the expiration of an aerosol particle that penetrated into the lung, was influenced slightly by the aerosol particle size in a range of 0.3-1 micron and at respiratory volumes not larger than 0.4 liter. At slightly increased respiratory volumes, the maximum of permeability was found in a particle diameter range of 0.5-0.7 micron, and the permeability dropped sharply for a particle diameter of 1.95 microns at respiratory volumes over 0.3 liter. In nasal respiration, the permeability dropped sharply in the first 50 cu m of the exhaled air, especially for large particles, which is due to the inertial separation in the nasal region. The minimum of the aerosol separation was 20% for oral respiration, and 30% for nasal respiration. Some 30-50% of all particles are separated in the nasal cavity in nasal respiration in a diameter range of 0.3-2 microns.

48352 **APTIC NO. 70060**

Mashiach, S., Kh. Zakot, Y. Slankstein, M. Shimron, and D. M. Sar

DETERMINING FETAL PULMONARY MATURITY BY TESTING SURFACTANT IN AMNIOTIC FLUID. *1973 (?). 10 refs. Translated from Hebrew, 13p.*

The chances of a newborn infant developing respiratory distress syndrome (RDS) rests in part on the formation of surfactant in his lungs. Since this substance escapes to the fetal sac, its concentration in the fluid forms an efficacious tool for measuring pulmonary maturity prior to birth. A simple, rapid, and inexpensive method to determine the presence of surfactant in the amniotic fluid is described which uses the ability of the fluid to generate stable foam in the presence of ethanol. The test uses the lecithin-sphingomyelin ratio for predicting the possibility of the fetus developing RDS after birth. If gestation is advanced and the presence of the surfactant in the amniotic fluid is proven, the test is reliable for predicting the appearance of RDS. The procedure is described, and tests of the method in 37 women are described.

48353 **APTIC NO. 69802**

McConnell, Ernest E. and H. David Specht

LESIONS FOUND IN ANIMALS EXPOSED TO COAL TAR AEROSOLS. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu. Fairborn, Ohio, 1973, p. 189- 198. 3 refs. (Oct. 16-18, Paper 14.)*

NTIS, DDC: AD 781031

Mice rats, rabbits, and hamsters were exposed to coal tar volatiles. The pathologic lesions found which were probably related to the exposure are described. Preliminary results of a second study, in which animals were exposed to 10 mg/cu m of a similar compound are also presented. The lung was the major organ studied, but skin and other organs were also considered. Coal tar volatiles appeared to be a significant skin carcinogen for mice and probably less so for rats and rabbits. The carcinogenic potential appeared to be both time- and dose- related. The skin tumors in mice once started did not regress spontaneously and showed no evidence of metastasis. In contrast, the tumors in rabbits appeared to spontaneously regress. The carcinogenic effect was probably due to the benzanthracene-type compounds within the coal tar aerosols. (Author summary modified)

48354 **APTIC NO. 69807**

Nettesheim, Paul

EXPERIMENTAL APPROACHES TO THE IDENTIFICATION OF CARCINOGENIC AIR CONTAMINANTS. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 243-249. 23 refs. (Oct. 16-18, Paper 19.)*

NTIS, DDC: AD 781031

It is estimated that 95% of all lung cancer is caused by pollutants such as tobacco smoke, occupational pollutants, and air pollutants. Since it is necessary to decide which of the various laboratory approaches currently used for respiratory- tract carcinogenesis studies are best suited for detection of carcinogenic air contaminants, the major considerations in selecting the appropriate bio-assay for detection of carcinogenic air pollutants are summarized. The selection of the test system depends on the research goals. Then a test animal must be chosen if in vivo assays rather than in vitro assays are chosen. The specific modalities of exposure, the physicochemical properties of the test material and problems related to obtaining or generating such material, and the means of relating the experimental findings to man must also be considered before determining the experimental methods. The most important facts currently available on the three most popular approaches used in respiratory tract carcinogenesis studies are summarized. These three approaches are intratracheal administration, the bronchial and pulmonary pellet technique, and inhalation exposures.

48355 **APTIC NO. 70236**

Nomura, Y. and F. Hirade

STUDIES OF THE EFFECTS OF AIR POLLUTION ON OTORHINOLARYNGOLOGICAL SYSTEM. *(Taiki osen no jibi-inkoka ni oyobosu eikyo ni kansuru kenkyu). Text in Japanese. Preprint, Tokyo Univ. (Japan), Medical School, 8p., 1973. 3 refs.*

In order to obtain information on the effects of air pollution on the otorhinolaryngological system, the following studies were carried out: distribution of lead in nasal and nasopharyngeal mucosa by histochemical and electronmicroscopic methods; a histochemical study on autonomic nerves in mucosa of the nasal cavity; and a histochemical study on the existence of mass cells in nasal mucosa. After finding that lead was not detected in nasal mucosa (to 5 micron in depth under mucous epithelium), that the nerves which were distributed in nasal glands were cholinergic, and that there were many mast cells in the collected nasal mucosa, especially those degranulated, the following conclusion was presumed: although a component of air pollutants, lead was not detected directly in nasal mucosa, therefore there are mechanisms which inhibit the invasion of foreign matter directly into the tissue. One of the mechanisms exists in mucous layers on mucosa; the polluted mucous layer probably stimulates the nasal mucosa to regranulate the mast cells which in turn secrete a chemical substance. The substance stimulates cholinergic nerves to secrete mucus from nasal glands, which regenerate the mucous layer anew.

48356 **APTIC NO. 70135**

Rall, David P.

A REVIEW OF THE HEALTH EFFECTS OF SULFUR OXIDES. *Preprint, National Inst. of Health Sciences, Research Triangle Park, N. C., 60p., Oct. 9, 1973. 93 refs.*

The extent of the demonstration of a cause-and-effect relationship between exposure to sulfur oxides and adverse health consequences, including the issure of dose-effect relationships, is discussed. Sulfur dioxide and products into which it may be converted in the air are irritating to the membranes lining the respiratory tract. The irritant effect causes reflex bronchoconstriction, slowing of mucus, flow depression of clearance of inert particles from the lung, and, in regions of high concentration, narrowing of airways from inflammatory swelling of membranes. Synergism between SO2 and soluble aerosols has been demonstrated in animals. The necessary experiments have not yet been performed under controlled conditions. Bisulfite, one of the reaction products of SO2 in droplets, has mutagenic effects on viruses and bacteria. The significance of this finding to human health, if any, cannot yet be evaluated. The physiological response found under controlled conditions give useful insights into mechanisms of action, but cannot be translated directly into advers effects of exposure to contaminated urban air. Review documents are included discussing atmospheric chemistry, toxicology, and epidemiology.

48357 **APTIC NO. 69872**

Rondia, D.

EFFECT OF AIR AND WATER POLLUTANTS ON HUMAN HEALTH. *(Effect des polluants de l air et de l eau sur la sante humaine). Text in French. J. Pharm. Belg., 28(5):605-627, 1973.*

Toxicological and epidemiological studies on the effects of air pollutants on human health are reviewed. The epidemiological approach is based on the study of the human population actually exposed to air pollutants in daily life. Levels of increasing toxicity were established for the commonest air pollutants such as lead, sulfur dioxide, nitrogen oxides, and various allergens. The effects of pollution on immunology and adaptation, of carbon monoxide on carboxyhemoglobin levels, of sulfur dioxide on mortality and morbidity in urban areas, of nitrogen oxides on electrolytes and glutathion, of ozone and NOx on respiratory diseases, and of pollutants on chronic bronchitis are reviewed.

48358 **APTIC NO. 70064**

Saknyn, A. V. and N. K. Shabynina

EPIDEMIOLOGY OF MALIGNANT NEOPLASMS IN NICKEL PLANTS. *(Epidemiologiya zlokachestvennykh novoobrazovaniya na nikelevykh predpriyatiyakh). Gig. Tr., no. 9:25-28, Sept. 1973. Translated from Russian, 7p.*

The chief hazard in nickel plants are aerosols which contain various nickel compounds at various stages of the process and cobalt and arsenic dust in the cobalt departments of the plants. Data were analyzed concerning cancer deaths in nickel plants from 1955 to 1967. The death rates from cancer were high in all nickel plants. In two plants they were 2.2-3 times higher and in two plants 1.2 times higher than normal. A comparison of data on deaths from malignant neoplasms among workers in nickel plants and the population of cities where these plants were located showed high death rates from cancer in nickel plants. The differences were statistically reliable in large combines with a great number of workers. Death rates from lung cancer were higher than in urban areas. In nickel plants processing oxidized and sulfide ores, a high death rate was noted from cancer of the lungs and stomach as well as sarcomas in comparison with the population living in the areas near the nickel plants. Lung cancer occurred more often in roasting- reducing workers employed in basic occupations exposed to the effects of aerosols of nickel sulfides, oxides, and metal; in electrolysis departments where work is conducted with a high concentration of electrolyte aerosols containing nickel sulfates and chlorides; in smelting departments where the workers were exposed to dusts from nickel ore; in cobalt departments where the chief hazard was cobalt dust; and in some plants, in combination with arsenic. Stomach cancer was found among workers in all basic departments. The average length of work of those dying from lung cancer in various nickel plants was from 7 to 13 years; for cancer of the stomach, from 10 to 14 years.

48359 **APTIC NO. 69806**

Shaffer, C. Boyd and Ralph C. Wands

GUIDES FOR SHORT-TERM EXPOSURE LIMITS TO HYDRAZINES. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 235-242. 27 refs. (Oct. 16-18, Paper 18.)*

NTIS, DDC: AD 781031

The short-term exposure limits for hydrazine, monomethylhydrazine, and 1,1-dimethylhydrazine are discussed. The physical and chemical properties of these compounds and their toxicology are reviewed. Limits which will probably be recommended by the Committee on Toxicology of the National Research Council are presented. The Short-Term Public Exposure Limits will probably be 15 ppm for 10 min, 10 ppm for 30 min, 5 ppm for 60 min, and 2.5 ppm for 5 hr/day, 3-4 days/mo for hydrazine; 9, 3, 1.5, and 0.3 ppm, respectively, for monomethylhydrazine; and 50, 25, 15, and 1 ppm, respectively, for 1,1-dimethylhydrazine. The Public Exposure Limits will probably be 30 ppm for 10 min, 20 ppm for 30 min, and 10 ppm for 60 min for hydrazine; 90, 30, and 15 ppm, respectively, for monomethylhydrazine; and 100, 50, and 30 ppm, respectively, for 1,1-dimethylhydrazine.

48360 **APTIC NO. 75046**

Sidorenko, G. I. (ed.)

GENERAL METHODOLOGICAL AND THEORETICAL PROBLEMS OF THE HYGIENE OF ATMOSPHERIC AIR. *(Obshchiye metodicheskiye i teoreticheskiye voprosy gigiyeny atmosfernogo vozdukha). USSR Academy of Medical Sciences, Moscow, A. N. Sysin Inst. of General and Communal Sciences, 120p., 1973. 85 refs. Translated from Russian, 188p.*

Several papers dealing with the methodological and theoretical problems of air hygiene and air pollution are presented. The following topics are discussed: methodological problems of the study of the combined and integrated effect on the organism of chemical contaminants of the environment; predicting maximum permissible concentrations of atmospheric contaminants based on their chemical structure, main physico-chemical properties, and correlation with experimentally sound standards; predicting the reflexive action of thresholds of organic compounds and their correlation with experimental values; simulation as one method of prediction in hygiene; method of predicting the level of air contamination by motor vehicle engine exhausts; several methodological approaches to evaluating the action of atmospheric contaminants; electroencephalographic indicators of the unfavorable action of odorous substances; activating role of several atmospheric contaminants in experimental pulmonary blastomogenesis; the allergic action of several atmospheric contaminants; methodological aspects of studying the structure and function of hygienic investigations; morphological investigation of an olfactory analyzer as a methodological approach to the evaluation of atmospheric contaminants; air contamination in certain cities and the morbidity of the population; selection and validation of a scale system of factors in the correlation analysis of morbidity of the urban population; multifactor correlation of the bronchitis morbidity of the population; methodological approaches to the study of nonspecific morbidity of the child population in relation to contamination of urban atmospheric air; determining the economic effectiveness of sanitizing measures in conservation of atmospheric air; and results of evaluating precision of readings of volume flowmeters used in analyzing atmospheric contaminants.

48361 **APTIC NO. 69367**

Smialek, M., M. Sikorska, J. Korthals, W. Bicz, and M. J. Mossakowski

THE GLYCOGEN CONTENT AND ITS TOPOGRAPHY AND UDPGLUCOSE: GLYCOGEN ALPHA-4 GLUCOSYLTRANSFERASE (EC 2.4.1.11). ACTIVITY IN RAT BRAIN AFTER EXPERIMENTAL CARBON MONOXIDE INTOXICATION. *Acta Neuropathol., 24(3):222-231, 1973. 15 refs.*

The glycogen content and its topography and the activity of UDPglucose-glycogen glucosyltransferase in the brain of rats after carbon monoxide intoxication were investigated. A transient increase in glycogen content and in the enzyme activity was noticed. The highest level of glycogen was observed after 4 hr, and the most significant increase of the enzyme activity after 2 hr, returning to normal values after 120 hr. In the histochemical studies, glycogen was deposited in the perivascular astrocytes, in their cytoplasm, and astrocytic processes. These changes were localized in the cerebral and cerebellar cortex and in the gray formations of brain stem and were expressed mostly after 4, 6, and 12 hr following CO intoxication. (Author abstract)

48362 **APTIC NO. 69808**

Stara, J., W. Moore, D. Hysell, S. Lee, J. Lewkowski, L. Hall, K. Campbell, and M. Wiester

TOXICOLOGY OF METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL (MMT) AND RELATED MANGANESE COMPOUNDS EMITTED FROM MOBILE AND STATIONARY SOURCES. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 251-270. 45 refs. (Oct. 16-18, Paper 20.)*

NTIS, DDC: AD 781031

Regulations requiring that an unleaded grade of gasoline be marketed for the 1975 automobile models prompted testing of other potential antiknock agents. As a result, methylcyclopentadienyl manganese tricarbonyl (MMT), has received renewed attention because of its antiknock effectiveness. The toxicology and public health aspects of manganese and MMT are reviewed. If MMT is used at the rate of 0.25 g Mn/gal in 50% of all gasoline consumed in the U. S., the motor vehicle exhaust would add 0.05-0.2 micrograms Mn/cu m to urban air. Rural concentrations would be 0.005 micrograms/cu m. This would result in a dose of 1-2 micrograms Mn daily for the urban dweller, and 0.1 micrograms for the rural dweller, compared with 500-7000 micrograms Mn ingested daily in the diet. Most (99+%) of Mn in MMT would be emitted from the automobile exhaust as inorganic oxides, primarily Mn_3O_4. Remaining traces of MMT would decompose rapidly in sunlight. Effects of MMT during accidental exposure in workers, experimental results on the toxicity of inorganic manganese compounds and manganese carbonyl compounds, and results of laboratory exposures to manganese cyclopentadienyl tricarbonyl (MCT) are reviewed. The toxicity of MMT is also reviewed, including the lethal effects after oral, dermal, and inhalation administration; inhalation toxicity; skin and eye irritation; uptake, distribution, and excretion of Mn after oral administration MMT; and distribution of Mn in pregnant rats following oral administration of Mn-MMT. It would appear resonable to use a low concentration of MMT as partial or complete replacement for lead in gasoline, assuming some amount of lead remains in gasoline.

48363 **APTIC NO. 69527**

Stupfel, M., F. Romary, M. Magnier, and J. Polianski

INFLUENCE OF AEROSOLS OF DISTILLED WATER AND OF AUTOMOTIVE EXHAUST CONDENSATES ON CERTAIN PHYSIOLOGICAL PARAMETERS IN RATS AND MICE. *(Effets d aerosols d eau distillee et d aerosols de condensats de gaz d echappement d automobiles sur quelques parametres physiologiques du Rat et de la Souris SPF). Text in French. Compt. Rend. Soc. Biol. (Paris), 167(6/7):860-864, June 1973. 6 refs.*

The effects of the aerosols of distilled water and of automotive exhaust condensate containing hydrocarbons, sulfur dioxide, nitrogen oxides, and aldehydes, on the physiological status of Sprague-Dawley rats and CF line mice were studied. The aerosol particles were smaller than 5 micron. Continuous exposure for 3 months to distilled water aerosol of 1 g/cu m concentration caused 3% reduction in the rate of growth from the 6th week in rats kept at a temperature between 5 and 20 C. However, intermittent exposure had no effect. Reduced rate of gain in weight was observed in mice exposed to exhaust condensate aerosol for 11 months starting from the 6th month as compared with a control group exposed to distilled water aerosol. Pigmentation of the anterior part of the lungs was observed in the mice exposed to exhaust condensate.

48364 **APTIC NO. 67572**

Takemoto, K., K. Namie, Y. Koizumi, K. Tashiro, and R. Endo

INFLUENCE OF AIR POLLUTION ON BIRD RESPIRATORY ORGAN (3)--PATHOHISTOLOGICAL STUDY ON DOVE LUNGS. *(Taiki osen no tori kokyuki no oyobosu eikyo (3)--hato hai no byorisoshikigakuteki kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):139, April 1973.*

The degree of lung pollution of doves living in residential-commercial districts, heavy industrial districts, and suburban residential districts was studied. High pollution was detected only downtown and in industrial districts. Doves make good pollution indicators because of their easy availability and the simple structure of their nasal cavities.

48365 **APTIC NO. 69924**

Thomas, Theodore James

AN INVESTIGATION INTO EXCESS MORTALITY AND MORBIDITY DUE TO AIR POLLUTION. *Purdue Univ., Lafayette, Ind., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-5056, 1973, 205p. 42 refs.*

A dose-response model for estimating the effect of particulate air pollution concentrations on individual expectation of life and disability loss was constructed and integrated with demographic data, with the results being converted to economic benefit. The mortality losses, measured by expectation of life and mortality rate itself, were related to particulate concentrations using a regression analysis applied to data for a target year of 1960. The observations for the variables of the regression were based on Standard Metropolitan Statistical Areas. Many explanatory variables for socio-economic status and meteorology were included in the regression analysis, requiring compensation in the regression procedure for the non-orthogonality of the independent variables. The techniques developed were applied to a regional air shed to estimate regional benefits resulting from five proposed sets of particulate control regulations. The validity of the use of life expectation as a measure of mortality loss was demonstrated. Regional losses due to air pollution, calculated to be typically 2 man-days/capita/yr, were greater than the costs of control of emissions, estimated at 6 dollars/capita/yr. Subtle illness losses were greater than losses due to major illnesses induced by particulate air pollution. The total moribidty loss was estimated at roughly twice the loss that would be estimated from bedridden and hospitalization rates. (Author abstract modified)

48366 **APTIC NO. 69804**

Weir, Francis W. and Thomas R. Rockwell

THE INFLUENCE OF ALCOHOL ON CARBON MONOXIDE TOXICITY IN HUMANS. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 211-220. 7 refs. (Oct. 16-18, Paper 16.)*

NTIS, DDC: AD 781031

The effects of carbon monoxide on persons who were dosed with ethyl alcohol were studied. Three series of experiments were conducted: a driving study, a parallel but independent laboratory study, and a laboratory dose-response alcohol experiment. Experimental design in the driving investigation consisted of eight subjects in each of the following groups: control with no alcohol, a control with 0.05% blood alcohol level (BAL), 7% carboxyhemoglobin (COHb) and no alcohol, 7% COHb and 0.05% BAL, 12% COHb and no alcohol, and 12% COHb with 0.05% BAL. For the second series of experiments conducted in the laboratory, six subjects were in each of the groups. The levels of ethyl alcohol chosen for the third experiment were 0.05% BAL, 0.05% BAL, 0.08% BAL, and control; four subjects were in each group. Preliminary evaluation of the data regarding the driving experiments revealed little or no difference in driving experiments revealed little or no difference in driving performance between the CO series and the CO plus alcohol series at either of the COHb levels tested. An interesting, but not statistically significant, difference was observed between control and 7% COHb levels in the open road driving occluded vision tasks -- the presence of alcohol appeared to shorten the mean open time per observation in both control and 7% COHb situations. The presence of alcohol appeared to depress the response to CO. In the laboratory experiments involving CO and alcohol, the 0.05% BAL did not remarkably influence the test performance of subjects at any COHb level tested. The mean response under the influence of alcohol was usually decreased, but the variance was increased so that no statistically significant differences were noted. Results of the dose response to alcohol experiments likewise demonstrated little or no effect attributable to the alcohol at up to 0.05% BAL. There were significant reductions in performance when BAL increased to 0.08%. Carbon monoxide thus did not act as a classical central nervous system depressant and did not add significantly to the alcohol effect at the concentrations tested.

48367 **APTIC NO. 69812**

Wyrobek, Andrew J. and Sheldon A. London

EFFECT OF HYDRAZINES ON MOUSE SPERM CELLS. *California Univ., Irvine, Toxic Hazards Research Unit, Conf. Environ. Toxicol., Proc. 4th, Annu., Fairborn, Ohio, 1973, p. 417-446. 32 refs. (Oct. 16-18, Paper 30.)*

NTIS, DDC: AD 781031

The applicability and sensitivity of murine spermatogenesis was studied as a test system by investigating three chemicals known to be biologically active. The effects of time and dose on the levels of mouse sperm with abnormal head shapes after subacute exposure to either hydrazine, monomethylhydrazine (MMH), or unsymmetrical dimethylhydrazine (UDMH) rocket fuels were studied. Results obtained from more conventional toxicological and pathological techniques were compared with results from this experiment. Three groups of 50 mice each received a subacute insult of hydrazine, MMH, or UDMH at a dose of 1/10 LD50/day. Five animals of each group were sacrificed by cervical dislocation at weekly intervals. The body weights, the ratios of testes to body weight, the histopathology of the testes, and the number and percent of abnormally shaped sperm per cauda epididymis were scored and the results compared. In dose dependent response tests, four to six mice received daily injections of UDMH at doses of 1/10, 1/4, 4/10, 55/100, or 7/10 the LD50. At 0.8 and 3.0 weeks postexposure, two or three animals at each dose level were sacrificed. Each group of animals was scored for body weights, testes to body weight ratios, testicular histopathology, bone marrow erythrocytic to myeloid cell ratios, hematocrit values, histopathology of five major organs, and the number and percent abnormally shaped sperm per caude epididymis. The effects of two subacute exposures for MMH (0.25 and 0.4 LD50 per day) and 0.25 LD50 for hydrazine were determined by describing only the level of abnormally shaped sperm in the cauda epididymis 3.5 weeks after the insult.

48368 **APTIC NO. 69184**

Zahorski, Witold

THE INFLUENCE OF THE WORKING ENVIRONMENT UPON THE STATUS OF THE RESPIRATORY TRACT. *(Wplyw srodowiska pracy na stan ukladu oddechowego). Text in Polish. Pol. Arch. Med. Wewn., 50(9):903- 908, 1973.*

The results of a study conducted in an Upper Silesian city, aimed at investigating the effect of air pollution on the status of the respiratory tract, are presented. The incidence of non-tuberculous diseases is much lower than other respiratory chronic diseases occurring in industrial workers (87%). Katowice is the smallest and most highly industrialized Polish area, containing 1/5 of the country's industry, while its Upper Silesian District constitutes the biggest agglomeration of industrial towns, with a population density equal to that of Rome and Berlin. The most hazardous working environments prove to be the metallurgical, textile, mining, and energy generating industries. In the latter, the hazard level reaches 75%. The hazardous pollutants are: chlorine, ammonia, sulfur dioxide, alcohol vapors, ethers, esters, and fumes of metal oxides. They lead to inflammations, irritations, or spastic states of the respiratory system. Particulates smaller than 2 micron, i.e., respirable dust, lead to changes in the respiratory system. The pollutants effect depends upon their characteristics, concentration level, and the time of exposure. In 1971, it was established in Bucarest that the diseases caused by dust inhalation are characterized by dust accumulation in the lungs and the tissue reaction to its presence. Depending upon this reaction, two categories of diseases can be discerned: collagen and non-collagen diseases. In the first case, collagen is produced, and lasting changes occur (as in asbestosis). In the second case, the tissue reaction limits itself to creation of reticular tissues, as in the case of inhaling zinc. Other known diseases are professional pneumathies, such as berylliosis. Some dusts, such as asbestos, chromium compounds, or radioactive minerals cause growth of tumors. Most often met professional diseases are fibrillations caused by professional exposure to the action of X-rays and gamma rays.

48369 **APTIC NO. 75037**

Japanese Pediatric Society, Morinaga Arsenic-tainted Powdered Milk Poisoning Investigation Special Committee

SUMMARY OF REPORT OF ACTIVITIES OF THE MORINAGA ARSENIC-TAINTED POWDERED MILK POISONING INVESTIGATION SUBCOMMITTEE (SPECIAL COMMITTEE) OF THE JAPANESE PEDIATRIC SOCIETY. *(Nihon shonika gakkai morinaga hiso miruku chudoku chosa shoiinkai (tokubetsu iinkai) katsudo hokoku katsudo hokoku yoshi). May 26, 1973. Translated from Japanese, 18p.*

The research program conducted to investigate the poisoning of children who drank arsenic-contaminated powdered milk is described. The policies of the special investigative committee are described, and the activities of the committee with respect to the Morinaga Milk Industry Co., Ltd., with respect to the Ministry of Health and Welfare, with respect to several interested groups, and with respect to the treatment and relief groups in various localities, are described. The current state of treatment and relief activities in various localities are reviewed. The organization of a system for medical examinations of the victims of the poisoning episode is described. Medical examinations in various locations have showed that there are still numerous medical problems requiring relief among the individuals who consumed Morinaga arsenic-tainted powdered in 1955. The main problems are intelligence disturbances, convulsions, brain wave abnormalities, other central nervous disorders, extreme fatigability, and certain specific skin troubles. Epidemiological methods should be used to study these persons. Insufficient standards were formulated for determining cures in 1957, and follow-up surveys were neglected. Consequently, the Japanese Pediatric Society should devote its powers to securing relief for present victims.

1972

48370 **APTIC NO. 69385**

Ferris, B. G., Jr., I. T. T. Higgins, M. W. Higgins, and J. M. Peters

POSSIBLE EFFECTS OF CHRONIC EXPOSURES TO LOW LEVELS OF SULFUR OXIDES AND SUSPENDED PARTICULATES. BERLIN, N. H. - 1961-1967. *Preprint, American Medical Assoc., Chicago, Ill., 10p., 1972. 3 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Correlations between chronic exposure to low levels of sulfur oxides and suspended particulates and the prevalence of chronic nonspecific respiratory disease were compared for the years 1961 and 1966-67 among adults (25-74 yr, random samples) living in the Berlin, New Hampshire area. During both periods, air pollution levels were measured with dust fall buckets, lead peroxide candles, and hi-volume samplers; while respiratory disease was assessed with a standard questionnaire and simple pulmonary function tests. As the levels of air pollution for sulfur compounds (SOx and sulfates) and particulates decreased between the two sampling periods, population surveys showed a lower prevalence of respiratory symptoms. These differences persisted after age standardization and when comparisons were made within a smoking category. Changes in pulmonary function were less clear-cut but did indicate the possibility of a slight improvement associated with decreased air pollution levels.

48371 **APTIC NO. 69523**

Hilscher, W.

CONTRIBUTION TO THE EXPERIMENTAL ASBESTOSIS IN WISTAR RATS. *(Beitraege zur experimentellen Asbestose der Wistarratte). Text in German. Zentralbl. Allg. Pathol., 116(3/4):413-416, 1972. 11 refs.*

The mechanism of fibrogenesis in asbestosis was studied in Wistar rats that were administered intraperitoneal injections of milled and microtomed crocidolite and chrysotile fibers of lengths ranging from 0.1 to 8.5 microns. Microscopic examinations revealed that long fibers caused fibrosis but short ones did not, which finding is in support of the mechanical theory of the pathogenesis of lung fibrosis in asbestosis. As demonstrated by morphological findings on giant cells and monocytes of asbestos granulomas, the fibrogenic action is essentially determined by the transportability of the fibers. Long fibers can cause fibrosis because they are phagocytized and consequently removed less readily than short ones.

48372 **APTIC NO. 69557**

Lave, Lester B. and Eugene P. Seskin

ACUTE RELATIONSHIPS AMONG DAILY MORTALITY, AIR POLLUTION AND CLIMATE. *Carnegie-Mellon Univ., Pittsburgh, Pa., Graduate School of Industrial Administration, Environmental Protection Agency Fellowship Grant AP48992-03, 30p., Sept. 1972. 33 refs.*

The effects of five air pollutants in five cities on daily mortality were statistically analyzed, with climatological and day-of-the-week variables also being included. A significant relation between pollutants and daily mortality appeared in only one of the five cities investigated, viz., Chicago. Only two pollutants, sulfur dioxide and nitric oxide, were statistically significant, with SO2 being much more important. Investigation of the lag structure revealed that high SO2 had a large immediate effect that gradually diminshed over time. The effect was delayed by several days for NO, then reached its peak, and finally diminished. The fact that SO2 was extremely significant (for Chicago) while NO was marginally significant and nitrogen dioxide and hydrocarbons were not significant indicated that stationary combustion and industrial sources were the problems in Chicago, not mobile sources. Displacing deaths by a few days was not an important consideration since the estimates corresponded closely to those from cross-section data. The other cities studied were Denver, Philadelphia, St. Louis, and Washington, D. C.

48373 **APTIC NO. 67111**

Norpoth, K., G. Manegold, R. Bruecker, and H. P. Amann

INVESTIGATIONS ON THE PROBLEM OF THE RELEASE OF ALKYLATING COMPOUNDS IN THE COURSE OF THE SMOULDERING PROCESS. *(Untersuchungen zur Frage der Emission alkylierender Verbindungen bei Verbrennungsprozessen). Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig. B., vol. 156-341-352, 1972. 14 refs.*

Auto exhaust gases and fumes from the limited aeration smouldering of plastics, paper, and cellulose at temperatures ranging between 300 and 500 C were collected in organic solvents. Chromatographic analyses show eight of the nine plastics materials examined, the exhaust gas, paper, and cellulose produced or contained substances which react in the same manner with nucleophil chromogens as the alkylating compounds. These results are discussed in connection with the possible hazard to health arising from the presence of alkylating carcinogens contained in the air of industrial areas. It is possible to concentrate the compounds detected in order to submit them to biological examination for their carcinogenic activity. These methods and further improvements of the trace analysis of volatile alkylating substances should provide a base for estimating the specific risk of toxicity, inherent in alkylating agents present in the air, to the community. (Author abstract modified)

48374 **APTIC NO. 69350**

Przyborowski, S.

PRIMARY DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT IN RELATION TO PARTICLE SIZE, BREATHING PARAMETERS AND REGION OF DEPOSITION. *International Radiation Protection Assoc., Health Phys. Probl. Intern. Contam., Proc. Eur. Congr. Radiation Prot., 2nd, 1972, p. 239-243. 5 refs.*

In vivo investigations of primary deposition in the human respiratory tract were carried out using a combined experimental- mathematical procedure. In the experimental procedure, the particle size distribution in the inspired and partial expired air was continuously measured. Sodium chloride was used as a test aerosol. Applying the aerodynamic diameter and considering the particle growth due to humidity in the respiratory tract, the results were independent of density and shape of aerosol particles. From the dependence of the obtained regional efficiency on velocity and particle size, it followed that impaction dominated in the upper three respiratory regions, and sedimentation dominated in the other regions for the investigated particle size range (0.6-3.0 micron diameter). The regional deposition in seven regions was correlated with the aerodynamic diameter. An application of the regional deposition curves is described using plutonium oxide aerosol.

48375 **APTIC NO. 67135**

Sorber, C. A., S. A. Schaub, and K. J. Guter

PROBLEM DEFINITION STUDY: EVALUATION OF HEALTH AND HYGIENE ASPECTS OF LAND DISPOSAL OF WASTEWATER AT MILITARY INSTALLATIONS. *U. S. Army, Edgewood Arsenal, Md., Medical Environmental Engineering Research Unit, Proj. 3A062110A806, Work Unit 136, Task Area 00, Rept. 73-02, 39p., Aug. 1972. 72 refs.*

NTIS, DDC: AD 752122

An evaluation is presented on possible health and hygiene consequences resulting from the use of treated wastewater for irrigation of land. Land wastewater application may result in human infection because of inhalation of bacteria-laden aerosols resulting from spray irrigation, and, to date, most biological aerosol determinations in wastewater have been from the analysis of aerosols formed at secondary sewage treatment plants. Land application may affect the flora and fauna of the local ecology and may also increase the types and numbers of disease vectors. Heavy metals, pesticides, and trace organics may cause soil toxicity problems. Biologically treated domestic wastewater also contains from 5-30 mg/l of total nitrogen, with the dominant form usually being ammonia or nitrate; the latter ion is the causative agent of methemoglobinemia in children. The removal of nitrate-nitrogen by denitrification, specifically in a groundwater recharge system is not clearly demonstrated and is far from being proven. Many of the detrimental health and hygiene aspects of wastewater land treatment can probably be reduced by proper wastewater pretreatment, including secondary treatment, filtration, and complete disinfection. (Author abstract modified)

48376 **APTIC NO. 67291**

Williams, Richard D., Jean D. Acton, and Quentin N. Myrvik

INFLUENCE OF NITROGEN DIOXIDE ON THE UPTAKE OF PARAINFLUENZA-3 VIRUS BY ALVEOLAR MACROPHAGES. *J. Reticuloendothel. Soc., 11(6):627-636, 1972. 8 refs.*

A 3-hour exposure of rabbit alveolar macrophages in vivo to an atmosphere containing 25 ppm of nitrogen dioxide does not prevent the uptake of parainfluenza-3 virus by thye macrophages. The exposed macrophages also are capable of producing virus RNA. Studies on the interaction of radioactive parainfluenza-3 virus with alveolar macrophages show that more virus attaches to NO2-treated macrophages than to normal macrophages. More virus also appears to penetrate NO2-treated macrophages than normal macrophages. The data presented indicates that the inability of NO2-treated alveolar macrophages to produce interferon is not due to a defect in adsorption, penetration, or uncoating of parainfluenza-3 virus or to the complete inhibition of RNA synthesis. Thus, the nature of NO2-induced biochemical lesion which inhibits interferon production remains to be elucidated. (Author abstract)

48377 **APTIC NO. 69691**

Osaka Municipal Government (Japan), Bureau of Environmental Protection

INVESTIGATIONS OF THE EFFECTS OF AUTOMOTIVE EMISSION GASES ON THE HUMAN BODY - A SUMMARY OF 1969, 1970 AND 1971 INVESTIGATIONS. *(Jidosha haishutsu gasu jintai eikyo chosa - 3 nenkan, Showa 44-nen, 45-nen, 46-nendo, yoyakuhen). Text in Japanese. 52p., July 1972.*

For three consecutive years (1969, 1970, and 1971), the residents along Highway 26 in Osaka, residents along ordinary traffic roads, and those in control area were given a questionnaire and a health examination, and air qualities were measured by mobile monitoring cars for sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, dusts, hydrocarbons, and the lead content in dusts by hi-vol samplers. For the health examination, the specific weight of blood, hemoglobin, blood cell volume, CO in exhalation, carboxyhemoglobin, respiratory functions, sputum, blood pressure, chest X-ray, and vital statistics were determined. In 1970, and urinalysis and cardiography were added. The most notable difference in the investigation was the geographical differences in the specific weight of total blood. This was not shown among men, who went away from their home environment for work during the day. But 24% women in high pollution district had low blood weight, but only 4% in the control area had low blood weight. This cannot be regarded directly as the result of automotive emission gases. And later in 1970, when another highway was built, the difference between the exposure and control areas were much less. There was no geographical differences in leucocytes or erythrocytes. But more women living along ordinary traffic road had low hemoglobin; the tendency was the same for blood cell volume. Generally, the residents along high speed expressway did not show significant hematological signs. This may have to do with dispersion condition of exhaust gases on speedways.

48378 **APTIC NO. 69758**

Osaka Municipal Government, Bureau of Environmental Health, Japan

THE INVESTIGATION OF THE EFFECTS OF AUTO-EXHAUST GAS ON HUMAN BODIES, NO. III: THE 1971 INVESTIGATION. *(Jidosha haishutsu gasu jintai eikyo chosa III - Showa 46-nendo chosa). Text in Japanese. 275p., Aug. 1972.*

Investigations of the environmental air, the consciousness of Osaka residents of the effects of air pollution on their health, and the physical effects of automobile exhaust gases were conducted in Osaka. The consciousness was investigated by a questionnaire covering eye abnormality, stuffed nose, increases of nasal discharge, increases of sneezing, discomforts in the throat, increases of coughs, and asthmatic attacks. In a relatively heavily polluted area, 124 men and 76 women were questioned, and 39% of them were aware of throat discomfort. About one third of these people have not done anything about it. The discomfort has not reached the level of asthmatic reaction yet. The sensitivity to all these symptoms were stronger among those who felt that they were not completely healthy. Non-smokers showed a slightly higher percentage of susceptibility to throat discomfort. The reactions to automobile emission gases were divided among those who felt the dust, those who sense the odor, and those who did not feel any exhaust gases. In a very polluted area, smokers had the highest rate of sensing exhausts by odor. In the ratio of annoyance from exhaust gases, noise, and house dusts, there was no difference between those who considered themselves healthy or weak. However, nonsmokers generally had the highest rate of considering themselves healthy. A follow-up of the health examination of residents along National Highway 26, an ordinary busy traffic road, and a control area was conducted and hematological studies were made. Consistent with the findings of the former studies, those women living along busy traffic roads had worse hematological symptoms than those women living along with high speed highways.

1971

48379 **APTIC NO. 75038**

Bikmullina, C. K., E. N. Panycheva, and I. S. Rozenshteyn

MORPHOLOGICAL CHANGES IN ANIMAL VISCERA DURING INHALATION OF LOW CONCENTRATIONS OF ARSENIC TRIOXIDE. *(Morfologicheskiye iz-*

meneniya vo vnutrennikh organakh zhivotnykh pri ingalyatsionnom vozdeystvii nizkikh kontsentratsii mysh yakovistogo angidrida). Vop. Gig. Prof. Patol. Tsvet. Chem. Met., 1971. 6 refs. Translated from Russian, 4p.

In order to study the hygienic and toxicological characteristics of low concentrations of arsenic trioxide such as those observed in the atmosphere, three groups of white rats were continuously exposed to the following low concentrations for a period of 3 months: 60.7 + or - 0.8 micrograms/cu m, 4.9 + or - 0.13 micrograms/cu m, and 1.3 + or - 0.08 micrograms/cu m. The fourth group of animals served as a control group. During the experiment there were functional shifts in the central nervous systems of animals in the first and second groups. The shifts were of the inhibition type, lowering the concentration of sulfhydryl groups in the blood and suppressing the activity of some enzymes. At the end of the experiment, accumulation of arsenic in the viscera was discovered. In animals of the third group which received the lowest concentrations of arsenic, neither functional nor biochemical changes were found. Pathomorphological investigations of the viscera of the experimental animals were carried out after the exposure period. The animals of the first and second groups had degenerative-dystrophic changes in the cerebrum, lungs, liver, kidneys, and gastrointestinal tract. No pathomorphological changes occurred in the viscera of the animals in the third group.

48380 **APTIC NO. 75047**

Chiriatti, G. N.

PREVENTION OF OCCUPATIONAL VANADIUM POISONING. *(Prevenzione della intossicazione professionale da vanadio). Folia Med. (Naples), vol. 54:57-76, March-May 1971. 46 refs. Translated from Italian, 27p.*

The presence of vanadium in humans is reviewed, properties of vanadium are discussed, and the effects of vanadium poisoning as an occupational disease are described. Vanadium is used in the steel industries, in various alloys, and as a catalyst and can be emitted into the air during any of these uses. Vanadium pentoxide is the most important compound. The role of vanadium in metabolism, studies of the amounts of vanadium in occupational exposure, the effect of vanadium on the inhibition of cholesterol synthesis, and other actions of vanadium with regard to biological activity are discussed. Absorption, retention, and excretion of V are mentioned. The mechanisms of V poisoning, sources of occupational poisoning, clinical descriptions of poisoning, and precautionary measures to limit V exposure such as maximum acceptable concentrations are also discussed.

48381 **APTIC NO. 69521**

Lukashev, A. A. and N. K. Shishkova

THE VITAMIN C AND B2 LEVELS IN THE TISSUES AND URINE IN ANIMALS FOLLOWING EXPERIMENTAL INHALATION OF MOLYBDENUM. *(Vitaminy C i B tkanyakh v moche zhivotnykh v khronicheskom eksperimente s ingalyatsionnym vvedeniyem molibdena). Text in Russian. Tr. Inst. Kraev. Patol. Kaz. SSR, no. 22:152-154, 1971. 5 refs.*

The effect of inhaled molybdenum trioxide on the vitamin C and B2 levels in tissues and in urine was studied in rabbits and rats exposed to 30 mg/cu m concentrations for 5.5 months. Molybdenum trioxide dust, caused an increase in the ascorbic acid levels in the blood plasma and in its urinary excretion in rabbits. The ascorbic acid excretion in the urine differed but only a little from that in a control group in rabbits that were additionally administered 50 mg sulfate daily in the form of sodium sulfate, while sulfate caused only a slight reduction in the plasma ascorbic acid level. Molybdenum had no effect on the ascorbic acid excretion and the ascorbic acid levels in tissues in rats. Molybdenum caused no changes in the riboflavin levels and excretion in rabbits and rats.

48382 **APTIC NO. 67055**

Masters, Richard L.

AIR POLLUTION--HUMAN HEALTH EFFECTS. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 97-130. 65 refs.*

The human health aspects of air pollution are discussed including the toxic agents. Representative findings are listed for gaseous and particulate toxic agents to illustrate magnitudes of concentrations which are of concern. The gaseous toxins include: ozone, photochemical oxidants, nitrogen oxides, sulfur oxides, carbon monoxide, and hydrocarbons. Aerosols and fumes are combined with particulates including: coal dust, asbestos, beryllium, lead, and other metals. These pollutants can be detected by their odor, visibility, eye irritation, and by acute episodes. Other topics discussed include ways in which the pollutants enter the body, methodology of studying the health effects, and inhalation of aerosols.

48383 **APTIC NO. 67070**

Moodie, T. W.

RELATIONSHIPS BETWEEN LIMITS SET FOR AIR POLLUTION, PERSONNEL TOXICITY AND HAZARDOUS AREA CLASSIFICATION. *Preprint, Instrument Society of America, Pittsburgh, Pa., 7p., 1971. 20 refs. (Presented at the Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-713.)*

Industry has become increasingly concerned about the working environment of its personnel and about its influence on its neighbors. These concerns have taken the form of tighter controls of material that would previously have been allowed to freely escape. More and more money is being spent on ventilation hoods in gas and vapor areas, and dust collection hoods in dusty areas with the associated separation, dilution, distribution, and other recovery systems. By controlling and preventing the escape of combustible materials, the extent of the area is reduced that is the most hazardous and the extent of the area toxic to workers is reduced. In a public area, the pollution and toxic limits are complied with by separation or dilution of the airborne combustible materials. Limits are given for hydrocarbons, carbon monoxide, particles, sulfur oxides, nitrogen oxides, and photochemical oxidants (smog). (Author abstract modified)

1970

48384 **APTIC NO. 70048**

Eisler, Ladislav, Radim Simecek, and Jaroslaw Ustupsky

EFFECT OF WORK IN VANADIUM ROOM ON RESPIRATORY PATH. *(Vliv prace ve vanadovne na dychaci cesty). Preprint, Ostrava Regional Hospital and Polyclinc (Czechoslovakia), Jaroslaw Ustupsky Section for Occupational Diseases, 1970 (?). 50 refs. Translated from Czech., 28p.*

Forty-eight workers from a metallurgical plant with an exposure of 9-17.6 years to vanadium were examined. The total number of chronic bronchitis cases evaluated according to Fletcher s criteria was 90%, out of which 52% were heavy forms of chronic obstructive bronchitis. A statistical comparison of the control groups from a normal population, the workers employed in the Bessemer process, and the hardeners exposed to lead showed that the highest rate of diseases of the respiratory tract occurred among the workers employed in the vanadium room. The gravity of the disease in the vanadium room was also confirmed by the incapacity of workers in comparison with other metallurgical workers. The main etiological factor in the respiratory disease was the dust containing vanadium dioxide potentiated by chromium and manganese.

1964

48385 **APTIC NO. 70041**

Jaraczewska, Wieslawa and Marek Jakubowski

THE ATTEMPT OF EVALUATION OF VANADIUM EXPOSURE IN THE CHEMICAL INDUSTRY. *(Proba oceny ekspozycji na wanad w przemysle chemicznym). Med. Pracy (Lodz), 15(6):375-383, 1964. 4 refs. Translated from Polish, 16p.*

In order to evaluate the exposure of chemical workers to vanadium, examinations were performed in three plants supplying vanadium contacts during sulfuric acid production. Vanadium was determined in air samples taken directly and in those collected using masks. Vanadium was also measured in the urine of the chemical workers. In three plants, the vanadium mean concentrations were respectively as follows: in the air, in samples collected using masks, 1.3, 0.25, and 0.007 mg/cu m; in samples taken directly, 36, 2.3, and 0.3 mg/cu m; in urine, before the shift ended, 220, 20, and 17 micrograms/l; and in urine, before the shift on the next day, 450, 90, and 40 micrograms/l. Examinations performed on animals showed a single-phase character of vanadium excretion from the organism. The tendency for vanadium to accumulate was not pronounced. Taking into consideration the short period of exposure on some days, as well as the results of vanadium determinations in air samples collected using the mask, the vanadium hazard was determined to be a moderate one.

1963

48386 **APTIC NO. 70050**

Eppenberger, H. M., R. von Fellenberg, R. Richterich, and H. Aebi

THE ONTOGENESIS OF CYTOPLASMATIC ENZYMES OF THE CHICK EMBRYO. *(Die Ontogenese von zytoplasmatischen Enzymen beim Huehnerembryo). Enzymol. Biol. Clin., vol. 2:139-174, 1963. 62 refs. Translated from German, 45p.*

The development of cytoplasmatic enzymes in the chicken was investigated from the third day of incubation to the adult animal. The investigation was concerned with glycolytic enzymes; some nonglycolytic enzymes were investigated for comparison. The individual development and differentiation of the individual enzymes were studied. For comparison with reference to their enzymontogenesis, five organs (liver, kidney, skeletal muscle, heart, brain) were investigated. The glycolytic enzyme distribution pattern at different stages is discussed. An atypical glycolysis of the five organs in the embryonic stage is discussed. Investigations of the complete embryo relative to the enzyme development must lead to incorrect conclusions. Each embryo in each type of cell, both in relation to beginning and to quantity of synthesis, passes through an individual development. On the basis of the established enzyme distribution pattern of the glycolysis, the question was raised regarding the limitation of the substrate flux by certain enzymes.

EFFECTS-PLANTS AND LIVESTOCK

1975

48387 **APTIC NO. 70115**

Bishop, J. A. and Laurence M. Cook

MOTHS, MELANISM AND CLEAN AIR. *Sci. Am., 232(1):90-99, Jan. 1975.*

The biological effects of pollution include changes in insect coloring caused by smoke. Some light species of moths turned dark in 19th century England because of the smoke. Now, some of these species are reverting to light forms as the air gets cleaner. The complex process of evolution is shaped by migration as well as by visual selection. The present pattern of frequency of the light and dark forms in populations of moths that inhabit two contrasting environments was studied in a region of intense urbanization and an adjacent but unpolluted rural region of England. The effect of pollution on lichens and algae and on tree trunk color was also noted. As pollution decreased, tree trunks became lighter in color and lichens had increased light reflectance. These factors probably led to the increase of light colored moths. The genetics of the moths, the advantages of nonmelanic moths compared with melanic ones, and the changes in melanism caused by pollution were studied. Aspects of melanic polymorphism were also studied.

48388 **APTIC NO. 70076**

Thompson, C. Ray and Gerritt Kats

EFFECTS OF AMBIENT CONCENTRATIONS OF PEROXYACETYL NITRATE ON NAVEL ORANGE TREES. *Environ. Sci. Technol., 9(1):35-38, Jan. 1975. 16 refs.*

Young navel orange trees and branches of a mature tree were enclosed and exposed for two years at Riverside, Calif., to activated carbon-filtered air, carbon-filtered air plus ambient levels of peroxyacetyl nitrate (PAN), or ambient air. The growth of the young trees was reduced by the addition of synthetic PAN at levels in ambient air. Leaf drop increased. With enclosed branches, significantly less growth occurred with PAN. Trends toward reduced yields of mature fruit occurred. Short-term apparent photosynthesis was not affected by fumigating a young tree with 20-80 ppb of PAN. (Author abstract)

1974

48389 **APTIC NO. 70284**

Akaiwa, K. and M. Shinozaki

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. SEC. F. EXPERIMENTS ON THE EFFECTS OF OZONE AND SULFUR DIOXIDE ON SEVERAL TREES. *(Yugai gasu ni yoru shokubutsu higai no kaiseki (1)-f. jumoku ni taisuru ozon, aryusan gasu no eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:73, June 1974.*

Seedlings of a cultivar of Rhododendron, Pasania edulis, Gardenia jasmoides grandiflora, Populus nigra, Hydrangea, Zelkova serrata, Syringa vulgaris, a species of acacia, and Magnolia liliflora were exposed to ozone at 0.2 ppm, sulfur dioxide at 1 ppm, first ozone then sulfur dioxide, and sulfur dioxide and then ozone at 0.13 ppm. The daily period of exposure was 5 hr. The time of exposure necessary for causing visible injury at 0.2 ppm of ozone was 11 hr for Populus nigra, 15 hr for Acacia, and 21 hr for Hydrangea. No visible injury was observed on Zelkova serrata, and Magnolia liliflora respectively exposed for 36 and 26 hr. The visible injury after exposure to sulfur dioxide at 1 ppm for 10 hr was most conspicuous on Populus nigra, and Syringa vulgaris, followed by Zelkova serrata, Magnolia liliflora, Hydrangea, Rhododendron, and Pasania edulis. No difference of visible injuries was found on trees exposed to ozone and then SO2 and those exposed to SO2 and then O3.

48390 **APTIC NO. 66764**

Carlson, Clinton E.

SULFUR DAMAGE TO DOUGLAS-FIR NEAR A PULP AND PAPER MILL IN WESTERN MONTANA. *U. S. Dept. of Agriculture, Missoula, Mont., Div. of State and Private Forestry, Rept. 74-13, 5200, 42p., April 1974. 15 refs.*

GPO: 1974-799-638/99

Serious needle browning, not caused by parasitic fungi or insects, occurred on Douglas-fir over 5200 acres of forested lands during the winter of 1972-73 near a paper and pulp mill at Missoula, Montana. Severity of the damage increased at decreasing distance from the mill; and total foliar sulfur content ranged from .00 to .63 in the area, with highest concentrations found in the most severely affected locations. Average sulfation rate was 1.52 mg sulfur trioxide/sq cm/day in the severely affected area and .96 mg SO3/sq cm/day in a lightly affected area. Plant symptoms as a whole were similar to those caused by excessive airborne sulfur compounds. Histological analyses of affected foliage showed the mesophyll cells to be affected first (plasmolysis and collapse), followed by hypertrophy and collapse of parenchyma in the vascular system. (Author abstract modified)

48391 **APTIC NO. 69943**

Cocking, W. Dean

PLANT COMMUNITY DAMAGE AND REPAIRABILITY FOLLOWING SULFUR DIOXIDE STRESS ON AN OLD-FIELD ECOSYSTEM. *Rutgers Univ., New Brunswick, N. J., Dept. of Botany, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-8769, 1974. 144p. 64 refs.*

Parcels of a first-year old-field on the New Jersey Piedmont were fumigated in translucent polyethylene chambers with single 1 ppm sulfur dioxide stresses for 4-hour periods throughout the 1971 growing season and also during the 1972 (single and repeated stresses) to examine plant damage and repairability effects in the community. Vegetation was clip sampled in treated and control herbage 1 week subsequent to each fumigation and at the end of the growing season in September. An overall quantitative evaluation of the impact on the community, which included both the magnitude of the initial damage to the system and the regrowth pattern of the plant community during the repair period, showed that there was a 17.0% reduction compared to control vegetation in the amount of photosynthetic surface area totaled over each day of the post-initial treatment growing season after a single stress. The reduction was 23.8% in the case of repeated stresses if the interval between fumigations was brief and 31.6% if the stresses were separated by a half a month. The total community impact of more widely spaced sulfur dioxide perturbations of the same intensity was thus greater than that of the same stresses occurring over a brief interval. (Author abstract modified)

48392 **APTIC NO. 66686**

Das, Gaurangakumar and V. C. Runeckles

EFFECTS OF BISULFITE ON METABOLIC DEVELOPMENT IN SYNCHRONOUS CHLORELLA PYRENOIDOSA. *Environ. Res., 7(3):353-362, June 1974. 24 refs.*

The effects of bisulfite on the metabolic development of the algae Chlorella pyrenoidoda grown in synchronous culture were investigated. Chloropyll, protein, ribonucleic acid (RNA), and desoxyribonucleic acid (DNA) decreased with the decline in cell population, as HSO3 negative ion concentration was increased. Biochemical analysis after treatment showed a differential change in thy levels of chlorophyll, protein, RNA, and DNA, when expressed as percentages of the cell dry weight. The content of chlorophyll b increased while chlorophyll a decreased gradually with increases in HSO3 negative ion. The amounts of protein and RNA per unit dry weight remained constant, but DNA levels were markedly reduced. With the exception of iron, the levels of nutrient elements within the cells increased with increasing HSO3 negative ion concentration. The relative increases were most marked with potassium, magnesium, calcium, copper, and sodium. The HSO3 negative ion adversely affects cell development by impairing DNA synthesis. (Author abstract modified)

48393 **APTIC NO. 70271**

Harvey, D. M. and C. L. Hedley

MULTICHANNEL SYSTEM FOR THE STUDY OF NET CARBON DIOXIDE PHOTOASSIMILATION BY LEAVES. *Lab. Pract., 23(10):567-568, Oct. 1974. 4 refs.*

A multichannel system for the study of net carbon dioxide photoassimilation by leaves is described. The central feature of the system is a water-cooled 35 cm diameter radially symmetrical assimilation chamber which includes two 6 mm (internal diameter) gas ports, one leaf temperature probe, and a recess for a plasticine-embedded leaf petiole. Net CO2 exchange is estimated with a multichannel infrared gas analyzer. The light source for the system is a water-cooled 6000 watt xenon arc lamp mounted in a central position 240 cm from the assimilation chamber floor. Leaf temperature is monitored with transistor-diode thermometer probes, with the sensor being placed in contact with the leaf underside. A known concentration of CO2 is continuously generated by a cuvette gas supply, with the relative humidity of the gas supply being predetermined by a temperature-regulated humidifier. The system has thus far been satisfactory for investigation of the effects of plant temperature and illumination history on subsequent net CO2 uptake by dicotyledonous leaves and for comparison of the relative efficiency of CO2 uptake by different genotypes.

48394 **APTIC NO. 65557**

Heggestad, H. E., C. E. Anderson, and W. A. Feder

DETERMINING ACCEPTABLE LIMITS FOR AIR POLLUTION DOSAGES AND VEGETATION EFFECTS: OZONE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 32p., 1974. 84 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-224.)*

Acceptable limits for air pollution dosages and vegetation effects of ozone are presented. Assessment from current publications is based on effects of single exposures to low (ambient) concentrations of ozone on several plant species, results of several successive exposures to ozone or ambient oxidants, and the effects of exposures to pollutant mixtures. Exposure to 5 pphm ozone for a few hours a day for several days will produce injury and reduce growth of many plants, especially when they are grown and exposed at high humidity. The primary standard of 8 pphm for 1 hr will probably cause little or no reduction in yield or productivity of most plant species. This concentration may be tolerated longer in arid areas than in humid areas. Separate studies for specific crops in different regions of the U. S. will be needed to determine the total dose of ozone that specific plants can tolerate without significant effects on productivity. Mixed gases can show coergistic effects. However, until there is more evidence of increased damage due to mixture of ozone and other gases under natural conditions, no adjustment in acceptable limits of ozone because of the possibility of mixed gases seems warranted. When ozone in ambient air is high, the concentrations of some other pollutants affecting plants, such as acid gases and ethylene, tend to be low.

48395 **APTIC NO. 70279**

Hiratsuka, N., M. Ito, M. Shinozaki, and M. Mako

EXPERIMENTS ON THE EFFECTS OF AIR POLLUTANTS ON HORTICULTURAL CROPS: PART I. INVESTIGATION OF LOCAL DAMAGE OF HORTICULTURAL CROPS. SEC. A. INVESTIGATION OF THE ACTUAL DAMAGE BY AIR POLLUTION USING INDICATOR PLANTS. *(Taiki osen busshitsu ga engei sakumotsu to ni oyobosu eikyo ni kansuru shiken (I) - c. shihyo shokubutsu ni yoru higai jittai chosaho). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect Agri. Integr. Inst.), 1973:74, June 1974.*

To see the actual state of the effects of air pollution, indicator plants such as mulberry trees, Satsuma-orange trees, ginkgos, zelkova trees, and pines were chemically analyzed for sulfur, fluorine, and several heavy metals, along with the air pollution data obtained at the monitoring points. The amounts of air pollutants decreased in the order of Ebina, Sagamihara, Aikawa, and Shiroyama cities in Kanagawa Prefecture. Fluorine content of the air was on the average 1.0-1.4 micrograms/day/100 sq cm (filter paper method) and higher in the spring than summer. The sulfur content of mulberry leaves was about 1400 ppm without a local difference, and fluorine content was around 11 ppm, a little higher in the middle part of the Prefecture and in Sagamihara. Sulfur content of Satsuma-orange leaves ranged in 0.1-0.3%, higher in spring than summer; however, no local difference was noticed in sulfur and heavy metal in the leaves. The sulfur content of ginkgo, zelkova, and pine tree leaves was respectively 0.2-0.4, 0.1-0.2, and 0.05-0.15, lower in rural areas than in industrial areas.

48396 **APTIC NO. 70283**

Hiratsuka, N. and M. Shinozaki

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. SEC. E. EXPERIMENTS ON THE EFFECTS OF OZONE AND SULFUR DIOXIDE ON MULBERRY TREES. *(Yugai gasu ni yoru shokubutsu higai no kaiseki (1)-e. kuwa ni taisuru ozon, aryusan gasu no eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:73, June 1974.*

Seedlings of a 1-year cutting of mulberry trees were exposed to ozone, ozone then sulfur dioxide, sulfur dioxide then ozone, and sulfur dioxide then ozone and further sulfur dioxide, the concentrations of ozone and sulfur dioxide being respectively 0.15-0.28 ppm (on the average 0.2 ppm) and 1 ppm. The period of each exposure was 6 hr in the daytime. No visible injury was observed on all the treated trees. The sulfur content of the leaves of treated trees, notwithstanding their position, increased by exposure to SO2. The amount was larger as the period of exposure was longer. The sulfur content of leaves of the trees exposed to ozone before exposure to SO2 was larger than that of the trees exposed to ozone after exposure to SO2.

48397 **APTIC NO. 69202**

Izumida, S. and M. Saeki

ON THE RELATIONSHIP BETWEEN LICHENS AND AIR POLLUTION IN AND AROUND SENDAI CITY. *(Sendai-shi shuhen ni okeru chii-rui to taiki osen tono kanren ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):414, Oct. 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 544.)*

All species of lichens which have grown on the tombstones in public cemeteries within a radius of 10 km in the center of urban Sendai were identified and the distribution of the lichen species was mapped. The ratio of the area of lichen growth vs. the number of tombstones on which lichen could grow was ranked into five levels and these indexes were also mapped, the species being Parmelia tinctorum, Parmelia caperata, Parmelia clavulifera, Parmelia reticulata. In another series of investigations, four lichen species growing on more than 5 sq m of the surface of black pine in areas 1, 2, 3, 4, 5, 6 and 7 km from a power station in the Sendai port were determined. Of the original 31 species, one type showed a distribution quite similar to that of sulfur dioxide in air; another type showed a reverse distribution to that of SO2, and still another type showed no reaction to air pollution. The four species above mentioned did not grow in the city parts of Sendai and Shiogama. When the growth was ranked into five levels, the distribution of the ranks coincided well with the distribution of SO2 in air. No lichens of the above mentioned species were found in the area where SO2 concentration in air was larger than 0.018 ppm.

48398 **APTIC NO. 70281**

Koto, M. and M. Shinozaki

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. SEC. C. EXPERIMENTS ON THE EFFECT OF OZONE AND SULFUR DIOXIDE ON DECIDUOUS FRUIT TREES. *(Yugai gasu ni yoru shokubutsu higai no kaiseki (1)-c. rakuyo kaju ni taisuru ozon, aryusan gasu no eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect Agr. Integr. Inst.), 1973:72, June 1974.*

Seedlings of 1-year old grafted persimmons of the variety of Fuyu and those of 1-year old cut grapes of variety of Delaware were exposed to ozone at 0.2 ppm for 13 hr, sulfur dioxide at 0.8 ppm for 5 hr, first to SO2 at 0.8 ppm for 5 hr and then to O3 at 0.15 ppm for 20 hr, and first to ozone and then to SO2. No visible injury was observed on the seedlings exposed only to ozone, however, the seedlings consecutively exposed to ozone and then to SO2 showed many brown spots on the top leaves of persimmons and on the base leaves of grapes. These injuries seemed a little worse than those that appeared on the seedlings exposed at first to SO2 and then to ozone. The increment of the sulfur content of the leaves was larger in grapes than in persimmons.

48399 **APTIC NO. 70282**

Mako, M. and M. Shinozaki

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. SEC. D. EXPERIMENTS ON THE EFFECT OF OZONE AND SULFUR DIOXIDE ON CITRUS UNSHU. *(Yugai gasu ni yoru shokubutsu higai no kaiseki (1)-d. mikan ni taisuru ozon, aryusan gasu no eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:72, June 1974.*

Two-year old trees of Citrus unshu were exposed to ozone, ozone then sulfur dioxide, sulfur dioxide then ozone, and sulfur dioxide then ozone, and then again sulfur dioxide. Concentrations of ozone and sulfur dioxide were, respectively, 0.15-0.28 ppm (on the average of 0.2 ppm) and 1 ppm. The single exposure period was 12 hr in the daytime. After the exposure, no visible injury was observed. The sulfur content of the leaves of exposed trees to SO2 increased about 20-30 %, and that of trees exposed to ozone before and after exposure to SO2 was the same as that of trees exposed only to SO2.

48400 **APTIC NO. 65179**

Munshower, Frank F.

BIOTIC MONITORING OF THE EFFECT OF POWER PLANT STACK EMISSIONS ON THE RANGE RESOURCE IN SOUTHEASTERN MONTANA. *Preprint, Air Pollution Control Assoc., 14p., 1974. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th Denver, Colo., June 9-13, 1974, Paper 74-5.)*

Biological monitoring can be used to determine the effects of power plant and other stationary source emissions on the ecosystem. A study was undertaken in southeastern Montana to determine the effect of trace elements (zinc, copper, iron, lead, cadmium), sulfur, and fluoride on the surrounding area. Trace element analyses of soils, plants, and animal were integrated with ecological investigations of the dominant plant communities. Low levels of fluoride occurred in plants and animals. Sulfur levels in plant tissues were 0.1-0.3%. Sulfur concentrations of 0.18% occurred in late summer pasture grasses, decreasing to 0.14% in cured winter grasses. Iron concentrations were normal (50-500 ppm) in all plants examined; concentrations of zinc and copper were below normal; lead and cadmium concentrations were less than 3 ppm and less than 0.3 ppm, respectively, in grasses. Visible sulfur damage occurred only on one pine within 1 mi of the power plant site. This study is the first attempt by a private utility in this area to provide advance warning of environmental degradation in the area surrounding a power plant. (Author abstract modified)

48401 **APTIC NO. 69588**

Rancitelli, L. A., K. H. Abel, and W. C. Weimer

ELEMENTAL CONTENT OF TRACE ELEMENTS IN VEGETATION COLLECTED AT CENTRALIA, WASHINGTON. *In: Pacific Northwest Laboratory Annual Report for 1973 to the USAEC Division of Biomedical and Environmental Research. Part 3. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 169-170, April 1974.*

NTIS: BNWL-1850 PT3

Neutron activation analyses for 28 major, minor, and trace elements in vegetation (pasture grass, tree leaves, moss, and lichens) near a 1400 MW power plant in Centralia, Washington were performed and compared with values for lichen samples collected from a remote region in Alaska. The grasses were selected to reflect recent deposition and uptake, while mosses and lichens were selected for their ability to display long-term effects of pollutants. Concentrations of arsenic, mercury, antimony, and selenium in lichens near the power plant were: 7.2, 0.12, 0.99, and 0.60 micrograms/g, respectively, an order of magnitude higher than Alaskan samples. The concentrations of the other 24 elements did not reflect increased values around Centralia.

48402 **APTIC NO. 70270**

Roberts, Bruce R.

FOLIAR SORPTION OF ATMOSPHERIC SULPHUR DIOXIDE BY WOODY PLANTS. *Environ. Pollut. 7(2):133-140, Sept. 1974. 25 refs.*

Foliar uptake of ambient sulfur dioxide (1.0 ppm) by container-grown seedlings of various woody plants was measured in an open-fumigation system. Maple, birch, and sweetgum showed appreciably greater vegetal sorption of SO2 on a unit area or unit weight basis (0.074-0.088 mg SO2/hr/sq dm or 0.267-0.268 mg SO2/hr/g) than did comparable species of rhododendron, ash, and azalea (0.044-0.056 mg SO2/hr/sq dm or 0.072-0.118 mg SO2/hr/g). Privet and firethorn showed intermediate responses. Under controlled environmental conditions, depletion of SO2 by foliage of firethorn remained relatively constant for periods up to 6 hr. There was no significant difference in the capacity of foliage from white ash and azalea to remove SO2 from the air at pollutant concentrations of 1.0, 0.5, and 0.2 ppm. However, leaves of birch and firethorn showed significantly less SO2 uptake at the 0.2 ppm concentration compared to uptake at higher concentrations. Foliage from certain woody plants appears to significantly reduce ambient SO2 levels in the microenvironment immediately surrounding individual leaves. (Author abstract modified)

48403 **APTIC NO. 69278**

Seibel, W., H. D. Ocker, and W. Nierle

HEAVY METALS IN GRAINS AND GRAIN PRODUCTS. *(Schwermetalle in Getreide und Getreideprodukten). Text in German. Deut. Lebensm. Rundsch., 70(9):315-318, 1974. 21 refs.*

The mercury content in domestic cereals (wheat and rye) was measured and varied between 1 and 20 ppb. Regional differences in mercury content could not be ascertained, and no firm differences between wheat and rye were found. The rather low Hg concentrations were in agreement with recent investigations made in Canada, England, America, and West Germany. The cereal s lead content was much more dependent on its site. The nearness of industrial facilities affected the lead content. Lead concentrations of 0.1-0.2 ppm were found in domestic cereals. The maximum allowable figure is 0.3 ppm Pb for cereal products. At 250 m from the highway Ruhrgebiet-Hannover, the measured lead concentration in grain was 0.15 ppm; directly next to the highway the concentrations were 0.40 ppm. At 1 km from a zinc plant, a lead concentration of 1.5 ppm was measured in corn. These concentrations were exceptions. Both heavy metals accumulated in the outer layers of the cereal grain. Milling yielded flours of lower heavy metal concentrations, with after-products, particularly brans, having considerably higher concentrations. Dry husking eliminated about half of the heavy metals in the original cereal; wet cleaning had practically no effect. Cadmium appeared to be well accumulated in the outer layers of the cereal grain. It can therefore be expected that a considerable portion of this metal will also be removed with the bran during the milling process.

48404 **APTIC NO. 69277**

Seki, Toshihiko, Yasuhiko Inoue, Koji Abe, Hidehiko Hoshikawa, and Norio Meguriya

THE EFFECTS OF AIR POLLUTION ON PLANTS (PART 11): THE EFFECT OF AIR POLLUTION ON LEAVES OF ROADSIDE TREES IN SENDAI- NO. 2: THE SULFUR CONTENT IN LEAVES. *(Taiki osen no shokubutsu ni taisuru eikyo (dai-2-ho), Sendai shinai ni okeru gairojuyo no taiki osen ni yoru eikyo ni tsuite, sono 2 (gairo juyo no io ganryo). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 4:86-93, Oct. 1974. 7 refs.*

At 30 locations on main artery roads in Sendai and six locations in the suburbs, samples of tree leaves were taken to see the effects of sulfur dioxide on trees. The sulfur contents were investigated in samples of gingko leaves at 17 locations, zelkova at nine locations, Chinese maples at four, tulip trees at four, and green paulonia at two locations. Samples were taken in late May, mid-August, and late October, 1971. The dusts from the surface of leaves were washed in clean water; the leaves were dried for 3 hr at 60 C, crushed in a bowl, and burned to ashes after adding magnesium. After a proper treatment, sulfuric acid ion was measured by absorption photometry and coverted to sulfur. According to the recovery rate test using the standard sulfuric acid ion liquid, when magnesium nitrate was added, the rate was 94.1-102.4%. The sulfur content in gingko leaves in the city was 0.31-0.41% (average 0.35%) in May, 0.50-065% (average 0.57%) in August, and 0.58%-0.80% (average 0.70) in October. The variation coefficients were 8.6, 8.8 and 10%, respectively. The averages of three suburban samplings were 0.20% for May, 0.33% for August, and 0.38% for October. The SO2 concentration between May and October ranged between 0.010-0.055 ppm in the city and 0.006-0.01 ppm in the suburbs. For gingko, regardless of the location, the sulfur content in August and October was 1.6-2 times over that of May. For paulonia, it was 1.3 times higher in October than two other times. For other trees, the sulfur level decreased by 30% in August and October. Compared to the levels of sulfur content in trees in Kawasaki and Yokohama business areas, Sendai leaves had 20-30% less sulfur content.

48405 **APTIC NO. 69580**

Shannon, J. G. and C. L. Mulchi

OZONE DAMAGE TO WHEAT VARIETIES AT ANTHESIS. *Crop Sci., vol. 14:335-337, March-April 1974. 12 refs.*

Two wheat cultivars, Arthur 71 and Blueboy, were exposed to 0.2 ppm ozone at anthesis for 4/hr/day for a week in a growth chamber. Yields were reduced by about 30 and 23% for Arthur 71 and Blueboy, respectively. However, the reduction for Blueboy was not statistically significant. Reductions in seed per plant and seed per head were not significantly different in the O3 treatment compared to the controls. Cultivars did not always respond in the same way to O3 for the characteristics studied. Ozone only slightly reduced kernel weight in Blueboy compared to a significant, 17.4% reduction for Arthur 71; however, seed set was significantly reduced by 22.1% in Blueboy compared to 8.3% for Artur 71. Since the O3 levels used in this experiment are often attained in fields near urban areas, the responses to O3 for wheat yield and yield components for the varieties studied should be comparable to actual field conditions. (Author abstract)

48406 **APTIC NO. 70280**

Shibutani, S. and Y. Yasunobu

EXPERIMENTS ON THE EFFECTS OF AIR POLLUTANT ON HORTICULTURAL CROPS: PART I. INVESTIGATION OF LOCAL DAMAGE OF HORTICULTURAL CROPS. SEC. B. EFFECTS OF AIR POLLUTANTS ON PEAR. *(Taiki osen busshitsu ga engei sakumotsu to ni oyobosu eikyo ni kansuru shiken (1) engei sakumotsu to no chiiki betsu higai jittai chosa, b. kaju (nashi) no shokusai shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect Agr. Integr. Inst.), 1973:74, June 1973.*

In the orchards at Kawasaki City, Yamato City, Isehara City, and Odawara City, the growth state, contents of the leaves, and yield of fruits of matured pear trees were investigated, as well as the degree of air pollution represented by sulfur oxides, nitrogen oxides, chloride ion, and dust fall. It seemed that air pollution, sulfur oxides of 0.08-0.36 mg/day/100 sq cm, nitrogen oxides of 0.01-0.06 mg/day/100 sq cm, chloride ion of 0.05-0.07 mg/day/100 sq cm, and dust fall of 7-25 tons/mo/sq km, progressed more in Kawasaki and Yamato cities than in Isehara and Odawara cities. The effects of air pollution were observed only on the rate of leaf fall.

48407 **APTIC NO. 70260**

Shinozaki, M. and M. Maeno

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. EXPERIMENTS ON THE ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: SEC. A, EFFECT OF REDUCING OZONE INJURIES ON SPINACH OF PIPERONYL BUTOXIDE. *(Yuga gasu ni yoru shokubutsu higai no kaiseki (1) yuga gasu ni yoru shokubutsu higai no kaiseki ni kansuru shiken; a. horenso no ozon shogai keigen ni kansuru piperoniru butokisaido no koka). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:71, June 1974.*

In order to discuss the effects of piperonyl butoxide on reducing ozone plant injuries, a series of multifactor experiments were carried out on spinach. The tested factors consisted of ozone exposure (0.2 ppm, for 3 hr), nitrogen fertilizer, potassium fertilizer and scattering of piperonyl butoxide on the leaf-surface, with corresponding levels of exposure of one and two times, one and two g, two and three g, and scattering and non-scattering. The results were: the number of leaves damaged on more than 30% of the surface area by a one-time exposure to ozone was 11.2 in an unscattered plot compared to 0.2 with piperonyl butoxide treatment in the scattered plot; that by two-time exposure to ozone was 15.4 in an unscattered plot, compared to 1.7 in a scattered plot; the effect of piperonyl butoxide persisted after 5 days of ozone exposure; potassium fertilizer when used in greater amount reduced the ozone damage a little; and there was a mutual action between potassium fertilizer and piperonyl butoxide scattering, potassium being a little effective when unscattered.

48408 **APTIC NO. 70285**

Shinozaki, M., M. Maeno, Y. Mizusawa, N. Hiratsuka, and K. Dohi

EXPERIMENTS ON THE EFFECTS OF AIR POLLUTANTS TO HORTICULTURAL CROPS: PART II. EXPERIMENTS. SEC. A. EXPERIMENTS ON THE EFFECTS OF CLEANED AIR TO THE GROWTH OF VEGETABLES. *(Taiki osen busshitsu ga engei sakumotsu to ni oyobosu eikyo ni kansuru shiken (2) osen busshitsu no engei sakumotsu to ni oyobosu eikyo shiken, a. kuki joka ga yasai to no seiiku ni oyobosu eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:74-75, June 1974.*

Welsh onion, spinach, morning glory, a salting green, Chinese cabbage, peanut, taro, turnip, and mulberry trees were grown in a polyvinyl chloride greenhouse into which fresh cleaned air (cleaned in a filter containing manganese catalyst and active charcoal) was introduced. The temperature difference between inside and outside of the house was maintained at about 5 C. The same species of plants were also grown in the same sized greenhouse into which fresh outside air was introduced (through a filter without a catalyst). At the times when a high concentration of photochemical smog occurred in the area of the greenhouse, conspicuous damage appeared on spinach, Welsh onion, and morning glory in the untreated control greenhouse, but in the greenhouse supplied with cleaned air, almost no damage was observed. The capacity of the catalyst was that the oxidant concentration was reduced to from a third to a fourth for consecutive 6 months. The cost of installing a set of such catalyst-bearing filters was about $1333.

48409 **APTIC NO. 69221**

Townsend, Alden M. and Leon S. Dochinger

RELATIONSHIP OF SEED SOURCE AND DEVELOPMENTAL STAGE TO THE OZONE TOLERANCE OF ACER RUBRUM SEEDLINGS. *Atmos. Environ., 8(9):957- 964, Sept. 1974. 18 refs.*

Significant variation in tolerance to 75 pphm ozone was expressed among red maple seedling progenies from four seed sources. Differences in seedling response occurred in extent of injury but not in type of injury. Seedlings from an Alabama source showed the least average foliar injury and least suppression of leaf growth after exposure to O3 in four stages of growth and four stages of leaf development. These Alabama seedlings also hibited the largest increase in height growth after each of the four fumigations. Foliar injury and suppression of leaf growth was greatest in Pennsylvania and Minnesota seedlings. Despite a high degree of foliar damage, the Pennsylvania progeny showed significant retardation of growth in only one plant-growth stage, when seedlings were youngest. In all sources and in all plant- growth stages, the youngest (less than 25 mm in length) and oldest (fully expanded) leaves were most tolerant to O.3. Leaves at least 90%, but not 100%, expanded were somewhat more susceptible. Leaves 25 mm or longer, but less than 90% expanded, were most susceptible to O3 injury. Seedlings in the two youngest plant-growth stages (4 and 11 cm) showed more foliar injury and height-growth suppression than those in the two oldest growth stages (24 and 32 cm). Fumigation of the Minnesota seedlings in the youngest growth stage caused an almost complete cessation of growth for 3 weeks. The stability of O3 tolerance during several plant and leaf ontogenetic stages signified strong genetic control. This will facilitate the selection of ozone- tolerant seedlings and seed sources of red maple. (Author abstract)

48410 **APTIC NO. 69320**

Townsend, Alden M.

SORPTION OF OZONE BY NINE SHADE TREE SPECIES. *J. Am. Soc. Hort. Sci., 99(3):206-208, May 1974. 13 refs.*

Significant interspecific and intraspecific variation was demonstrated in the rate of foliar sorption of ozone at a concentration of 0.2 ppm. White oak and white birch leaves removed the largest quantities of O3/hr on both a /g and a /sq dm basis. Red maple and white ash were the least efficient; coliseum maple, sugar maple, redvein maple, Ohio buckeye, and sweetgum were intermediate in rate of O3 removal. Differences in ozone uptake were significant among four seed-source progenies of red maple. A group of seedlings from Pennsylvania demonstrated higher rates of sorption than progenies from Maine, Minnesota, and Alabama. Although significant, the differences among the red maple progenies were not as great as differences in O3 uptake rate among most species. Sorption rates by white birch seedlings increased linearly with increasing O3 concentration from 0 to 0.8 ppm. Red maple seedlings showed a linear increase in sorption rate from 0 to 0.5 ppm;

from 0.5 to 0.8 ppm, O3 uptake rate continued to increase with increases in concentration, but not linearly. During a continuous 8-hour fumigation at only 5%. Removal of O3 by red maple foliage dropped rapidly after 6 hr of continuous exposure, and after 8 hr the rate had decreased 40%. (Author abstract)

1973

48411 **APTIC NO. 69784**

Baker, J., D. Hocking, and M. Nyborg

EFFECT OF ATMOSPHERIC SULFUR DIOXIDE ON THE PH OF RAIN INTERCEPTED BY FOREST TREES. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 98-102. 3 refs. (Nov. 1-2.)*

Eight collection sites were established up to 8 mi from a gas processing plant which emits up to 84 long tons of sulfur dioxide per day in a lodgepole pine-dominated forest. Three control sites were established 10-12 mi upwind from the plant. Rainfall was collected in clearings and in immediately adjacent stands of lodgepole pine. Analyses were performed on samples for pH and sulfate levels. The average pH value of rain was 0.6 pH units lower than that of the control sites. The pH values of both throughfall and stemflow were 1.8 units lower at the sites near the plant than at the control sites on the average. These results were obtained from Aug. 17 to Aug. 30. Intercepted rain was consistently higher than open rain in total sulfate content. The increased acidity of intercepted rain could have been due to the adsorption of emitted SO2 on the surface of needles and/or tree bark. Data on sulfate content were consistent with this hypothesis, but not yet supportive of it due to the deficiency in analytical method. The SO2 emissions did acidify intercepted rain more than open rainfall. Stemflow was the most acid. The impact of the very acid stemflow on soil acidity would likely be limited to an extremely small area at the base of the tree. This increased acidity of intercepted rain may help to explain the fate of some SO2. Emissions in forests may be adsorbed and later washed off in intercepted rain.

48412 **APTIC NO. 69787**

Case, James W.

THE USE OF LICHENS AS BIO-INDICATORS OF SULPHUR DIOXIDE. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 120-128. 32 refs. (Nov. 1-2.)*

Lichens are sensitive to sulfur dioxide and other pollutants and may be used to measure pollution. The correlation between air pollution and lichen distribution has been substantiated in many studies. Many techniques have been used to correlate the distribution of lichens around air pollution sources including Zone mapping, Index of Atmospheric Purity (IAP) mapping, and transplants. An IAP map an be used to show the total area affected, to present a relative picture of the pollution concentrations, and to show the long-term effect of the sulfur dioxide emissions on the epiphytic lichens. The map could be used in settling disputes as to the effects that SO2 from a sulfur extraction gas plant has on various components of the surrounding countryside. Zone mapping has limited application in Alberta because the ecology of most lichen communities has not been adequately studied. Transplant studies are more time- consuming than the IAP mapping method, although they are useful as a back-up to IAP mapping.

48413 **APTIC NO. 69399**

Davis, Denzil R. and Charles E. Dean

AGRICULTURAL REQUIREMENTS FOR ATMOSPHERIC OZONE MEASUREMENTS. *Preprint, 9p., 1973. 34 refs. (Presented at the Technical Conference on Observations and Measurements of Atmospheric Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

An ozone-monitoring program and advisory service which was established to serve the needs of agricultural interests of north Florida and south Georgia is discussed. The program has been operational for 10 years. The project studied meteorological conditions which contribute to high ozone concentrations, correlated the outbreaks of weather fleck with ozone concentrations, and developed a procedure for predicting increases in ozone concentrations and weather fleck outbreaks on tobacco. The results of ozone measurements from 1963 to 1973 are summarized. Seasonal variations, direct movement of stratospheric ozone, indirect ozone movement from the primary source region, low-level photochemically produced ozone, correlation of plant damage with ozone concentrations, and a procedure for forecasting ozone plant damage are discussed.

48414 **APTIC NO. 68602**

Gardner, Wayne S.

OZONE INJURY TO TOBACCO PLANTS IN SOUTH DAKOTA. *Plant Disease Reptr., 57(2):106-110, 1973. 21 refs.*

Ozone injury symptoms appeared on Turkish tobacco plants grown in a greenhouse and on Wisconsin 38 tobacco plants grown in field plots at Brookings, South Dakota in 1970. In 1971, ozone injury appeared on greenhouse and field-grown plants of the Bel-W3, Bel-C, and Turkish types. Ozone fleck was most severe in southeast and east-central South Dakota. A decreasing amount of injury was observed in northeast, central, west-central, and southwest South Dakota. The Bel-W3 tobacco showed injury at eight locations, while Turkish, Bel-C, and Bel-B were injured only in the eastern parts of the state. The Bel-W3 was a reliable monitor of air pollution episodes when plants were continuously produced and observed in the greenhouse at Brookings. New injury appeared on newly matured leaves and older leaves as dark gray to black flecks that turned brown to tan to white with age. Periodic ozone occurrences were recorded by new flecks appearing generally on tissue of younger age. Plant indicators for the pollutants peroxyacetyl nitrate, fluoride, and sulfur dioxide showed no injury in South Dakota. (Author abstract modified)

48415 **APTIC NO. 69488**

Gilbert, O. L.

LICHENS AND AIR POLLUTION. *In: The Lichens. Vernon Ahmadjian and Mason E. Hale (eds.), New York, Academic Press, 1973, Chapt. 13, p. 443-472. 80 refs.*

Various aspects of the effects of air pollution on lichens are reviewed including historical aspects, lichen deserts, environmental effects, and use of lichens as biological indicators of air pollution. The area around an industrial area or city may become a lichen desert, since lichens decrease in number in polluted air. Lichen species increase in number and variety with increasing distance away from urban areas. A lack of data makes it impossible to compare lichen deserts on a truly worldwide scale. There are, however, enough studies from Europe and North America to make it clear that in these areas the zoning of epiphytes is outstandingly similar. The most resistant epiphytic foliose lichen in Europe is Hypogymnia physodes, closely followed by Parmelia sulcata and Physcia tenella. On basic substrata, Lecanora dispersa is the most resistant lichen. The effect of industrial point sources of sulfur dioxide on lichens is similar to that of cities, despite the different patterns of fumigation involved. The causes of lichen deserts are described. Two phytotoxicants, sulfur dioxide and fluorine, have been identified as the major pollutants affecting lichens. The field, analytical, and experimental evidence supporting SO2 as the major city influence are reviewed. The effects of SO2 on growth and metabolism are discussed. The effects of individual habitat factors such as shelter, pH, nutrients, water relations, substratum, seral stage, growth form, and systematic position on the toxic effects of SO2 to lichens are discussed.

48416 **APTIC NO. 69596**

Guderian, R.

DAMAGES CAUSED BY EMISSIONS FROM CONVENTIONAL POWER PLANTS IN VEGETATION AND FOOD. *(Schaeden an Vegetation und Nahrung durch Immissionen aus konventionellen Kraftwerken). Text in German. Strachlenschutz Forsch. Prax., vol. 12:81-97, 1973. 59 refs. (Presented at the Association of German Radiation Protection Physicians and the Association for Radiation and Environmental Research, 12th Conference, Munich and Nueherberg, West Germany, Oct. 8-9, 1971.)*

Studies and observations on plant damage caused by gaseous and particulate emissions of thermal power plants are surveyed. Dust emissions from obsolete power plants with no adequate filters affect plants in the immediate vicinity by reducing exposure to sunlight and increasing the local temperature on the leaves the dust settles on. While the damaging effect of dust from modern thermal power plants equipped with efficient filters is negligible, such power plants and industries emit considerable amounts of sulfur dioxide and fluorine, the most harmful compounds for plant life. These gases penetrate into the leaves through the stomata. Sulfur dioxide reduces the phytosynthesis, temporarily stimulates dissimilation, and, when present in higher concentration, dehydrates the plant by destroying the osomotic potential, and metabolizes chlorophyll to pheophytin. Intercoastal necrosis is caused by SO2, while apical and edge necrosis is due mostly to fluorine compounds. The plant damage due to SO2 and fluorine compounds may manifest itself in reduced yield and quality impairment as well as esthetic deterioration. Fluorine, readily accmulating in leaves, is hazardous for animals and humans ingesting fluorine-contaminated plant materials. The extent of SO2-afflicted damage increases progressively with increasing concentration, and can not be characterized by the product of concentration and exposure time.

48417 **APTIC NO. 69869**

Hirai, A. and F. Tsuda

THE CHANGE OF THE AMOUNT OF CHLOROPHYLL CONTAINED IN PLANT LEAVES CAUSED BY AIR POLLUTION. *(Taiki osen ni yoru shokubutsu yo no yoryokuso ganryo no henka). Text in Japanese. Kinki Daigaku kogai kenkyusho, Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), no 1:175-180, June 1973. 11 refs.*

The blades of various kinds of plants were dipped under constant conditions in solutions of constant concentrations of sodium azide (NaN3), sodium fluoride, and sodium sulfite which were used as examples for air pollutants. The chlorophylls of these leaves were extracted with ether and acetone. Each absorption at 624, 644, and 663 nm was measured with a spectrophotometer, and the amounts of chlorophyll a and those of chlorophyll b were calculated. When the leaves were dipped in these drug solutions, the total amounts of chlorophyll decreased before signs of the disease visible with the naked eye occurred. Chloropyll a decreased much more than chlorophyll b did. The ratio of chlorophyll a/b decreased when the leaves were dipped in these drug solutions compared with the blank leaves dipped in water. On the other hand, the ratios of chlorophyll a/b of leaves etiolated by virus disease and of leaves etiolated and weak by physiological causes were no different from that of healthy leaves. The decrease in the ratio of chlorophyll a/b depended on the characteristics caused by the actions in these drug solutions.

48418 **APTIC NO. 70044**

Jordan, C. F.

TERRESTRIAL ECOLOGY: INTRODUCTION. *In: Radiological and Environmental Research Division Annual Report. Ecology. January through December 1973. Argonne National Lab., Ill., p. 160-164, 1973. 6 refs.*

NTIS: ANL-8060 Part III

The studies of the Terrestrial Ecology Program at the Argonne National Lab are discussed. Studies were completed on tritium in ecosystems; the effects of radiation on photosynthesis, respiration, and carbohydrate metabolism; the economic impact of non-nuclear energy sources on agricultural crops; and the impact of sulfur dioxide on photosynthesis, respiration, production of soybean plants, and quality of protein and carbohydrates in the soybean fruit. The techniques and equipment used in the study of the effects of SO2 on soybeans can be used in other experiments regarding the effects of other pollutants on crops. Sulfur dioxide was studied because of its current projected importance as a pollutant.

48419 **APTIC NO. 70065**

Jordan, C. F. and M. J. Koziol

ENERGY ALLOCATION IN BEANS (PHASELOUS VULGARIS L.) FOLLOWING SULFUR DIOXIDE EXPOSURE. *In: Radiological and Environmental Research Division Annual Report. Ecology. January through December 1973. Argonne National Lab., Ill., p. 165-176, 1973. 19 refs.*

NTIS: ANL-8060 Part III

Studies of energy allocation by plants have recently been used to investigate functions of various types of plants and plant parts, and how these functions vary in relation to environmental parameters. Little work has been done on the effect of air pollution stress upon energy allocation and use by plants. Changes in energy use by plants subjected to sulfur dioxide were evaluated to gain fundamental knowledge about the functional response of plants under stress. the terms energy and energy dynamics of plants are used to convey the idea of how solar radiation is captured, stored, and used by the plant to carry out its functions. An effort was made to quantify response as a function of the sulfur dioxide uptake rather than exposure. Seeds of kidney bean plants were grown in exposure chambers and exposed to SO2. Sulfur dioxide at low levels caused a large and statistically significant increase in the concentration of free sugars in all plant tissues. As SO2 increased, free sugar increased and then decreased until at relatively high levels where the plants showed large areas of visible damage, the level dropped down to that of the control or slightly below. Sulfur dioxide at low levels also increased starch in leaves. At higher levels, starch concentrations dropped to the level of the controls. During a study of plant metabolism, net photosynthesis decreased and respiration increased as a function of increasing amounts of SO2. A large part of the photosynthesis reduction was due to the high respiration apparent immediately after the beginning of the dark period. In the study of the effect of SO2 on productivity, by the end of 1 wk of exposure to 1 ppm, there was a significant difference between the dry weight of the plant leaves, stems, roots, and total dry weight of the experimental and control plants. Thus, in response to SO2 stress, bean plants diverted energy away from synthesis of new tissue and away from storage and kept energy available in the form of sugars to repair and replace damaged cells. This diversion resulted in an increase in respiration, a decrease in net photosynthesis, and a decrease in production.

48420 **APTIC NO. 69874**

Komai, K. and S. Sato

COMPLEX POLLUTIONS ON PLANTS CAUSED BY SULFUR DIOXIDE AND PESTICIDES. *(Shokubutsu ni taisuru aryusan gasu to noyaku no fukugo osen). Text in Japanese. Kinki Daigaku kogai kenkyusho, kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), no. 1:9-15, June 1973. 15 refs.*

In order to have some idea of the effects of plants of the coexistence of sulfur dioxide and pesticides, chloroplasts were studied. The Hill reaction and oxidative phosphorylation activities of spinach chloroplasts were measured against treatment with sulfur dioxide and pesticides under both conditions in vitro and in vivo. Moreover, the influence of paedogenesis on chlorophyll biosynthesis and anthocyan pigment biosynthesis was also examined. Spinach chloroplast fragments prepared after SO2 treatment showed a marked decrease in activities in both the Hill reaction and oxidative phosphorylation conjugate with Hill reaction compared with chloroplast fragments with no treatment. These chloroplast fragments with treatment showed more decrease in activity with the addition of pesticides. The chloroplast fragments prepared after treatment with both SO2 and pesticides showed a marked decrease in activities in both the Hill reaction and oxidative phosphorylation compared with those prepared after treatment with only SO2 and those treated with only pesticides. They inhibited stronger reactions with organophosphates than with BHC. Moreover, those treated with both SO2 and pesticides showed marked inhibition reaction in the biosynthesis of chlorophyll and anthocyan pigment.

48421 **APTIC NO. 69788**

Lee, Thomas and Dale H. Vitt

A PRELIMINARY STUDY OF THE EFFECTS OF AIR POLLUTION ON LICHEN AND BRYOPHYTE VEGETATION NEAR EDMONTON, ALBERTA. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 129-141. 18 refs. (Nov. 1-2.)*

Epiphytes such as lichens and mosses are responsive to pollutants such as sulfur dioxide, and can be used to monitor these pollutants. The ability of epiphytes to measure pollution was studied in Edmonton, Alberta, Canada. Lichens and mosses were sampled on aspen and balsam poplars. The frequency of occurrence was then determined for each species. An Index of Atmospheric Purity was then computed. In the Fort Saskatchewan area, there were eight species of epiphytes, in Refinery Row there were 17. In rural areas there were 24 species. Most lichens had low mean frequencies in the Fort Saskatchewan area that increased in the Refinery Row area and were highest in rural sites. Mosses, while almost absent from the Fort Saskatchewan area, did not increase significantly on rural sites over their frequencies near Refinery Row. The Index of Atmospheric Purity was lowest for the Fort Saskatchewan area (11), highest for the rural areas (38.6), and close to the rural area values in the vicinity of Refinery Row (35.7). The two sites at Refinery Row were 12% lower than the rural area, while the two sites near Refinery Row were 3% lower. Mean total cover values closely paralleled the Index of Atmospheric Purity values: lowest for Fort Saskatchewan (8.9) and highest for rural areas (29.1), although Refinery Row values were close (28.7 and 25.9).

48422 **APTIC NO. 69786**

Legge, Allan H.

DESIGN OF A GAS-EXCHANGE SYSTEM FOR THE STUDY OF THE EFFECTS OF SULPHUR DIOXIDE ON VEGETATION. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 115-120. (Nov. 1-2.)*

A gas-exchange system was developed for the intimate analysis of the effects of sulfur dioxide on vegetation in the Whitecourt area of the sour-gas corridor in the province of Alberta. Research is underway on 1-year-old seedlings of white spruce, voss, and lodgepole pine to determine quantitatively the effects of varying concentrations of sulfur dioxide under differing environmental conditions. Plant physiology is being correlated with the onset of visible plant symptom development with air quality. The gas-exchange system was designed to continuously record processes of photosynthesis, respiration, and transportation in plants. The rate of carbon dioxide uptake determines primary production in green plants. The heart of the system is double-linked growth chambers in which the plants are exposed to SO2 and gas-exchange is measured. The exposure chamber and measurement instrumentation are described.

48423 **APTIC NO. 69785**

Loman, A. A.

SULPHUR DIOXIDE AND FOREST VEGETATION. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, p. 106-110. (Nov. 1-2.)*

In Alberta, sulfur dioxide symptoms have appeared and disappeared on forest vegetation in the vicinity of sour gas plants. The range of symptoms observed cannot be adequately described in terms of acute and chronic symptoms. Instead, the symptoms are described as transient -- temporary symptoms which are transitory during the growing process. Continuous monitoring of ambient air in the vicinity of gas plants has shown that SO2 episodes frequently consist of pulses of high SO2 concentrations lasting a few seconds, interspersed with short periods free from SO2. Periods of steady levels of elevated concentrations of pollutants appeared to be less common than previously believed. Marketable forest species in Alberta may be ranked in order of decreasing susceptibility to SO2. The impact of short-term effects on forests may be determined as a function of the frequency of occurrence of SO2 episodes on the same plants during one growing season. Long- term effects must be assessed by regularly monitoring the buffering capacity of forest soils.

48424 **APTIC NO. 67066**

Nobel, Park S. and Cheng-Teh Wang

OZONE INCREASES THE PERMEABILITY OF ISOLATED PEA CHLOROPLASTS. *Arch. Biochem. Biophys., 157(2):388-394, 1973. 39 refs.*

The effect of short-term exposure of chloroplasts isolated from the leaves of Pisum sativum (peas) to high concentrations of ozone was examined. The inhibitory effect of O3 on endogenous photophosphorylation was apparently related to an increased permeability of the chloroplast limiting membranes induced by O3 exposure. A 5-minute treatment with 50 ppm O3 reduced the reflection coefficient of meso-erythritol from 0.84 to 0.58 and that of glycerol from 0.26 to 0.03. Such decreases in reflection coefficients indicate that O3 caused a marked increase in the permeability of the limiting membranes of the chloroplasts, which may result from an oxidation of membrane lipids. The decrease in the reflection coefficient of meso-erythritol was proportional both to O3 concentration (up to 30 ppm for 5 min of bubbling) and to time (up to 5 min at 30 ppm). Extrapolating these results to lower concentrations and longer times, O3 injury should be possible for a 2-hour exposure to plants to 0.3 ppm O3, as is indeed the case. (Author abstract)

48425 **APTIC NO. 67107**

Oelschlaeger, W.

THE PROBLEMS INVOLVED IN SAMPLING WITHIN AND OUTSIDE ZONES OF EMISSION. *(Die Problematik bei der Probeentnahme von Futtermittein in und ausserhalb von Emissionsgebieten). Text in German. Landwirt. Forsch. Sonderh., 26(1):89-99, 1973. 27 refs.*

Problems involved in the sampling of plant materials both inside and outside emission zones are considered, especially in regard to trace element analysis. The basic problem revolves around obtaining as accurately as possible an average sample of actual composition. Elimination of error possibilities requires a knowledge of such factors as botanical composition, vegetation stages, rains, mass losses in leaf and blossom parts, contamination through the soil, and gaseous or particulate emissions. Sampling and preparation of samples is also considered with respect to quantitative aspects of trace element analysis.

48426 **APTIC NO. 69401**

Siegel, S. M.

LEAD: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY (SEMI- ANNUAL REPORT). *Hawaii Univ., Botany Dept., National Aeronautics and Space Administration Grant NGL 12-001-042, NASA-CR-138385, Hawaii Univ. Botanical Science Paper 32, 63p., May 1973. 22 refs.*

NTIS: N74-22959

The abundance of lead in soil s and vegetation in Honolulu, Hawaii was studied. Parkland soils and vegetation were heavily contaminated with lead and zinc from automobiles. Copper in the same soils and vegetation may also have come from automobiles. Some of the lead appears to have entered terrestrial food chains. The lead values for roadside grasses (20-1050 micrograms/g) and soils (30-4300 micrograms/g) are among the highest reported for exhaust contamination. By comparison, grasses from one of the busiest intersections on the sparsely populated island of Kauai contained 52.5 micrograms/g plant. The background level for lead in Hawaiian vegetation may be less than 5 micrograms/g. The high values on Oahu reflect unusually high traffic densities in the vicinity of the sampling sites, the prevailing winds, and the high mean annual temperature. Lead and other metals were also measured in the Ala Wai Canal. The extent of lead consumption for Oahu is described. The amount of lead oxide or lead nitrate absorbed by the fungus Aspergillus clavatus Desm was tested in the laboratory.

48427 **APTIC NO. 65162**

Urabe, Takeyuki, Kaoru Kayama, Toru Tadamasa, Etsuho Inoue, and Shunsaku Hirayama

STUDIES ON THE EFFECT OF AIR POLLUTION ON TREES AND ON THE GROWTH OF GREEN TREES. (II). *(Taiki osen no jumoku ni oyobosu eikyo narabi ni ryokka jumoku ikusei ni kansuru kenkyu (II)). Text in Japanese. Okayama-ken Ringyo Shikenjo Hokoku (Bull. Okayama Prefect For. Exp. Stn.), no. 13:202-222, Oct. 1973.*

Following up the 1971 investigation of the effects of air pollution on trees, investigations were made on 20 red pines at 13 locations near Kurashiki. Meteorological data were obtained from the Kurashiki Municipal Pollution Monitoring Center and the Okayama Regional Weather Observation Station. The trees were checked in July, early September, late September, and December, and sulfur trioxide was measured monthly by lead dioxide. The sulfur contents from the needles of three red pines that were studied in 1971 were examined by the combustion quick analyzing method. Pollution levels were high between April and August, and December and March. The averages at the 13 locations ranged from 0.02 to 0.63 mg SO3/day/100 sq m. The highest pollution count was 1.06 mg. The relationship between the height of the trees and the distance from emission sources was not clear. There was no correlation between pollution and the diameter growth of trees. Several parasitic diseases were noted, and the degree of damage was much more serious than 1971. The correlation between pine needle deterioration and pollution index was lower than 1971 but still existed (0.4705). Although there seemed to be a definite relationship between pollution and tree deteriorations, its nature was not clear. For instance, the discoloration and blemishes noted on the needles in the most polluted areas were not characteristic damages of SO2. Young tree seedlings were planted in a polluted area with 0.5-0.6 mg SO3/day/100 sq m. Most seedlings died due to transplantation rather than pollution. The sulfur content was high in the leaves of eucalyptus, coral trees, rose of sharon, and sweet oleander.

48428 **APTIC NO. 67067**

Yang, Shang Fa and Mahmoud A. Saleh

DESTRUCTION OF INDOLE-3-ACETIC ACID DURING THE AEROBIC OXIDATION OF SULFITE. *Phytochemistry, vol. 12:1463-1466, 1973. 16 refs.*

Indole-3-acetic acid (IAA) was rapidly destroyed in the presence of manganese ions (++), oxygen, and sulfite ion. The optimal pH for the reaction was between 5 and 6. The destruction was dependent on the aerobic oxidation of sulfite, but was not inhibited by superoxide dismutase. Tracer studies indicated that IAA was converted into at least three compounds. Decarboxylation of IAA was not involved in the destruction. This reaction is important in studying the effect of sulfur dioxide in IAA, a natural hormone, in vegetation. (Author abstract modified)

48429 **APTIC NO. 69783**

Nyborg, M. and McKinnon, Allen and Associates, Ltd.

ATMOSPHERIC SULPHUR DIOXIDE: EFFECTS ON THE PH AND SULPHUR CONTENT OF RAIN AND SNOW: ADDITION OF SULPHUR TO SURFACE WATERS, SOIL, AND CROPS: AND ACIDIFICATION OF SOILS. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 79-97. 14 refs. (Dec.)*

The deposition of sulfur dioxide on the earth was studied. Objectives of the study were to find if SO2 emissions acidify precipitation, soils, and water under Alberta conditions; and to determine the amounts of SO2 adsorbed directly by vegetation, soils, and water at different distances from gas plants in Alberta. In 1972, 12 stations were established near the Shell Waterton gas plant which has a maximum emission of 124 long tons/day of sulfur. Eleven stations were close to the plant, and one control station was 25 mi away. In 1973, the number of stations was increased from 12 to 19, and 59 additional stations were established in other areas of Alberta. Four control stations were placed in Saskatchewan. Thirteen were located near the Aquitain Ram River gas processing plant which emits 84 long tons of S per day. Rain and snow were analyzed for pH, sulfate, calcium, magnesium, sodium, potassium, ammonium, and nitrate. The effects of the emissions on soil pH and sulfur added to the soil were also studied. Absorption of sulfur emissions by water was estimated in experiments near the Waterton and Ram River plants in 1973. The sulfur emissions were brought to earth through direct absorption by soils, vegetation, and water, as well as by deposition in rain and snow. The amounts of S deposited in rain were very small, and the problem of acid rain was much less severe than in heavily industrialized parts of the world. The soils downwind from emission sources received enough S (primarily through absorption) to cause gradual lowering of soil pH.

1972

48430 **APTIC NO. 69947**

Brodo, I. M.

LICHENS AND CITIES. *Proc. Int. Symp. Ident. Meas. Environ. Pollut., Ottawa, Ontario, 1972, p. 325-328. 27 refs.*

Although the detrimental effect of urban atmospheres on lichen growth has been known for over 100 years, it has only been within the last 10 years that a serious effort has been made to use lichens as a means of detecting and even measuring air pollution. The development of these efforts is described with special consideration given to recent attempts to quantitize the lichen assay method. Various techniques are described and commented upon. The complicating environmental factors affecting lichen growth in cities, other than air pollution, are also discussed. These include drought, light intensity, and other microclimatic changes. Air pollution appears to be the overriding factor in the city effect, however. The relationship between sulfur dioxide levels and lichen appearance and absence (lichen deserts) is discussed. Suggestions for future approaches to studies on the relationship of lichens to cities are also given. (Author abstract modified)

48431 **APTIC NO. 68613**

Faller, N.

ABSORPTION OF SULPHUR DIOXIDE BY TOBACCO PLANTS DIFFERENTLY SUPPLIED WITH SULPHATE. *Isotop. Radiat. Soil-Plant Relat. Incl. Forest., Proc. Symp., Vienna, Austria, 1971, p. 51-58, 1972. 10 refs. (Dec. 13-17.)*

Tobacco plants were fumigated in glass cages with 1.5 mg of sulfur dioxide/cu m of air. The sulfate concentration in the nutrient solution ranged from zero to a relatively high content. The gas for fumigation was tagged with S(35)O2, which made it possible to record the total absorption of sulfur from the air, transformation of the absorbed gas into other compounds, and its distribution to separate organs. The plants fumigated with SO2 and without sulfate nutrition showed an increase parallel with that of the plants favorably supplied with sulfate by roots. This proves that SO2 can be the only source of sulfur for higher plants. The total absorption of SO2 per plant, as well as per unit of leaf weight, concurred in separate treatments, whereas higher concentrations of SO2 did not have a negative effect. The greatest part of the absorbed SO2 was oxidized in the plant into the SO4 form, and a smaller part was reduced and incorporated into organic compounds prevailing in the insoluble fraction. The greatest part of S absorbed from the air remained in the leaves, though all the fractions were recorded in the stalk and in the root. The plants absorbed more S from the air than from the optimal SO4 nutrient solution. Translocation of SO4 from leaves to the root was insignificant, confirming the known poor basipetal movability of this form. In contrast to the low content of the labelled SO4 form, the insoluble organic fraction was considerably higher in the root; the difference from the leaf was moderate. The smallest difference between the root and leaf was in soluble organic compounds, which points to the established balance and to efficacious basipetal mobility. There was a general decrease in the SO4 absorbed from the air in the organic fractions of the nutrient solution. (Author abstract modified)

48432 **APTIC NO. 67122**

Granger, Jean-Maurice

COMPUTER MAPPING AS AN AID IN AIR-POLLUTION STUDIES: MONTREAL REGION STUDY. *Sarracenia, vol. 15:43-83, Jan. 1972. 6 refs.*

A technique is described for evaluating the pattern and intensity of urban air pollution in the Montreal region using computer mapping of epiphyte sensitivity. The Montreal region is divided into two areas, rural and urban, with the boundary line being approximately 10 mi from the city center. Regression analysis is used to relate the index of atmospheric purity with the number of epiphytes per station. The land-use intensity index and the number of epiphytes per station are also correlated. Regression analysis indicates that the variation in index of atmospheric purity is almost completely explained by the variation in the number of epiphytes, with a 97% degree of information being retained. Twin selection of four species (recorded by presence and coverage only) offers a degree of information retention of 91.4% in the urban area and 95.7% in the rural area. The appropriate spread of the two selections, explaining at least 80% of the index of atmospheric purity, fits a grid with a spacing of 1 mi in thye urban area and 2 mi in the rural area. About six-sevenths of the urban values fall into the most polluted category, assuming an equal value range over eight categories. This occurs for an urban density threshold of about 28 persons/acre.

48433 **APTIC NO. 69800**

Jones, L. H. P. and D. W. Cowling

EFFECTS OF AIR POLLUTION ON PLANTS. *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-13, Part 2, p. 71-79, 1972. 59 refs. (Presented at the National Society for Clean Air, Annual Conference, 39th, Scarborough, England, Oct. 16-20, 1972.)*

The effects of air pollution on plants are reviewed. Certain features of plants which affect their susceptibility to pollutants are discussed including stomata, leaves and photosynthesis. Pollutants, environmental factors, and specific pollutants (sulfur dioxide, fluorides, smoke, soot, dust, photochemical smog, and oxidant), and plants as indicators of air pollution are reviewed. The paper is then discussed.

48434 **APTIC NO. 75032**

Materna, Jan

EFFECT OF LOW SULFUR DIOXIDE CONCENTRATIONS ON THE FIR. *(Einfluss niedriger Schwefeldioxydkonzentrationen auf die Fichte). Mitt. Forst. Bundesvers, vol. 97:219-232, 1972. 8 refs. Translated from German, 15p.*

The effect of low concentrations of sulfur dioxide on fir trees was studied in a long-term experiment. The effects of SO2 were checked through both external features and chemical analyses of needles. The plants were exposed to less than 1 mg SO2/cu m air, with most concentrations below 0.5 mg SO2/cu m. Sulfur dioxide was continuously monitored and needles were sampled irregularly and analyzed for potassium, calcium, magnesium, phosphorus, glucose, fructose, sucrose, starch, vitamin C, and chlorophyll a and b. The firs were gassed for almost 2000 hours during 6 years. The gassing caused a significant increase in the sulfur level in needles, and produced an increase in K, Ca, and partially in Mg and P. In some cases, an increase in the total amino acid content and a reduction in the content of starch, glucose, sucrose, vitamin C, and chlorophyll a and b occurred. There was an unfavorable effect on the growth in height of the gassed firs. Actual external injury was established clearly in only one case.

48435 **APTIC NO. 69324**

Nieboer, E., H. M. Ahmed, K. J. Puckett, and D. H. S. Richardson

HEAVY METAL CONTENT OF LICHENS IN RELATION TO DISTANCE FROM A NICKEL SMELTER IN SUDBURY, ONTARIO. *Lichenologist, vol. 5:292-304, 1972. 25 refs.*

The Sudbury region of Ontario has large deposits of nickel, iron, and copper, and thus a number of smelting plants which produce sulfur dioxide and heavy metal pollution. Since lichens are good indicators of SO2 pollution levels, the pattern of heavy metal content in lichen species in the area of a copper smelter in Sudbury was correlated with distance from the smelter to ascertain whether lichens might also be good indicators of the amount of heavy metal fallout. The lichens were analyzed qualitatively and quantitatively. All seven species of lichens contained copper, iron, zinc, nickel, manganese, and lead. Cadmium and cobalt were detected in two species. Neither gold nor silver could be identified in lichen material with the tests used. A pollution model was developed and compared to field results. The simple dilution of the stack effluent was consistent with the fact that the lichen metal content was related to the reciprocal of the distance from the pollution source. The lichens from the area could tolerate simultaneously high concentrations of several heavy metals that are known to be toxic to other plants. The mechanism of metal uptake was not clearly established. The study showed that lichens and other epiphytes are potentially the most useful indicators of heavy metal fallout around industrial plants.

1971

48436 **APTIC NO. 75036**

Boertitz, Siegfried and Hans-Guenther Daessler

PVC TRASH AS A SOURCE OF PLANT DAMAGE. *(PVC-Muell als Ausgangspunkt fuer Pflanzenbeschaedingungen). Nachrichtenbl. Pflanzenschutzdienst D. D. R., 25(2):34-36, 1971. 11 refs. Translated from German, 7p.*

Various products arise from burning and smouldering material. Plants growing near trash incinerators or dumps where trash is burned may be harmed by the toxic products which are formed, such as sulfur dioxide. Polyvinyl wastes burned in trash dumps can produce hydrogen chloride which can cause plant damage. Smoke damage from this pollutant is discussed. Hydrogen chloride from the burning of polyvinyl chloride refuse may cause leaf damage, defoliation, and yield depression of fruit trees, berry bushes, vines, vegetables, and other plants. In spite of the expected quantitative increase in the plastics refuse, the possibility of its thermal decomposition on dumps should be eliminated in order to prevent damage to the vegetation.

48437 **APTIC NO. 70174**

Hsieh, S. T. and K. H. Kwan

EFFECTS OF THE AIR POLLUTION ON THE METABOLISM OF THE SUGAR PHOSPHATES AND CARBOHYDRATES OF TOBACCO. *(Kon chi wu zan twei yen tsau lin tang gi tan suei hua wu tai hsieh yin hsian chi yen chin). Text in Chinese. Taiwan Tob. Wine Monop. Bur. Tob. Res. Inst. Ann. Rept., 1971:130-138, 1971. 33 refs.*

Ozone injury in the tobacco plants Bel-W-3 (cigar-wrapper tobacco), Bel-B, and Vam-Hicks (flue-cured tobacco) was studied in relation to levels of sugar phosphates and carbohydrate metabolism. Experiments with different phosphorus supplies indicated that lower phosphorus levels increased the plants sensitivity to spotting, while higher phosphorus levels significantly decreased leaf spotting. Lesions in the tobacco leaves were caused by ozone, with Bel-W3 being the most susceptible, Vam-Hicks being of moderate susceptibility, and Bel- B being ozone resistant. Bel-W3 appeared useful as a plant indicator for ozone. Exposure of the three tobacco varieties to ozone resulted in dry weight losses of 19%, 15%, and 9% for Bel-W3, Vam-Hicks, and Bel-B, respectively. Ozone injury was associated with levels of sugar phosphates, starch, and total carbohydrates. Leaves containing less sugar phosphates were more susceptible to ozone injury, as were leaves with higher reducing sugars and less starch.

48438 **APTIC NO. 67056**

Linzon, Samuel N.

EFFECTS OF AIR POLLUTANTS ON VEGETATION. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 131-151. 100 refs.*

The effects of various air pollutants on vegetation are outlined. Information on symptoms of injury, dosages required to cause injury, sensitivity and tolerance of various plant species, and predisposing environmental and other factors are discussed. Consideration is also given to methods of investigating and preventing the effects of air pollutants on vegetation. The specific pollutants discussed include: sulfur dioxide, oxidants, ozone, O3 and SO2 synergism, peroxyacetyl nitrate, nitrogen oxides, fluorides, chlorine, hydrogen chloride, ethylene, ammonia, mercury, and particulate matter.

48439 **APTIC NO. 75043**

Nikolayevskiy, V. S. and V. V. Suslova

GAS RESISTANCE AND CERTAIN CHARACTERISTICS OF ABSORPTION OF S35O2 BY LAWN GRASSES. *(Gazoustoychivost i nekotoryye osobennosti pogloshcheniya S35O2 gazonnymi travami). Gorkiy (A. M.) State Univ. (USSR), Perm Order of the Red Banner of Labor, Uch. Zap. Perm. Ordena Trydovogo Krasnogo Znamenii Gos. Univ. im. A. M. Gorkogo, 1971, 277(5):137-142. 6 refs. Translated from Russian, 12p.*

The dependence of susceptibility to damage of lawn grasses on accumulation of sulfur(35) dioxide and the effect of the contaminated soils of a chemical plant on plant resistance were studied. Lawn grasses were fumigated with 0.3% by volume SO2 for 1 hr and grown on peat or on soils from a chemical plant. Lawn grasses were the most convenient objects for the study of the patterns of gas resistance, since they permit avoidance of the subjective visual estimation method of damage evaluation. A new method of determination of susceptibility to damage to lawn grass plants was developed. It was proposed that the differences in gas resistance of individual species were determined by physiological and biochemical characteristics of the plants and that, in populations of each species, by the anatomical and morphological characteristics of the leaf structure and the amount of acid gas absorbed. The S(35) activity of all species of plants was three-25 times higher in dead leaf tissues than in living. The S(35) transport through the vessels with the water flow to the leaf tips was accomplished to a greater extent in monocotyledenous plants than in dicotyledenous ones. Toxic compounds accumulated by the soil, depending on concentration and chemical nature, can cause the death of seeds or a decrease in germination, impairment of growth and development, and changes in resistance to SO2. An increase in gas resistance was generally observed. Lethal concentrations of SO2 in plants of resistant species were higher than in nonresistant ones. The former are probably capable of better and more completely absorbing SO2 in their tissues. Plants with larger leaf surface dimensions proved to be more resistant to SO2. This dependence could be connected with characteristics of the physiological and biochemical processes in species with different growth rates.

48440 **APTIC NO. 75045**

Nikolayevskiy, V. S.

SOME REGULARITIES IN ABSORPTION OF SULFUR DIOXIDE BY WOOD PLANTS. *(Nekotoryye zakonomernosti pogloshcheniya sernistogo gaza drevesnym rasteniyami). Gorkiy (A. M.) State Univ. (USSR), Perm Order of the Red Banner of Labor, Uch. Zap. Perm. Ordena Trydovogo Krasnogo Znamenii Gos. Univ. im. A. M. Gorkogo, 1971, 277(5):29-35. 10 refs. Translated from Russian, 12p.*

The rate of absorption of sulfur dioxide by trees, flowers, lawn grasses, and weeds is directly proportional to the susceptibility of the leaves to injury. The rate of absorption of SO2 in nonresistant species is two-five times and more than that of resistant ones. A statistically inverse correlation connection has been established in woody plants between the number of stoma per sq mm and susceptibility to injury by SO2. By means of the infiltration method, the daily dynamics of movement of stoma in five species of woody plants were determined. The dependence of susceptibility to damage of plants on the daily dynamics of movement of the stoma was determined, and the reaction of the stomatal apparatus to the effect of sublethal concentrations of SO2 was studied. The degree of stoma opening was determined by the infiltration method three times a day on 42 species of woody plants. The effect of SO2 on the stomal apparatus was determined by the infiltration method after exposure on the morning of the test. The susceptibility to damage of woody plants by SO2 was related to the time of day and the amount of sunlight. The species susceptibility to damage was almost unchanged with time of day. Previous conclusions on the role of number of stoma per sq mm and their extent of opening in gas exchange rate and gas resistance were confirmed. The reactions of the stoma to the action of the gas showed that the resistant species have greater ecological plasticity, which allows them to decrease the rate of gas absorption.

48441 **APTIC NO. 68657**

Sato, Akira and Hiroaki Yamamoto

STUDY ON ENVIRONMENTAL POLLUTION IN IWATE PREFECTURE--15TH REPORT: SURVEY OF HEAVY METALS CONTAINED IN UNHULLED RICE, VEGETABLES, AND SOIL IN MIYAKO CITY. *(Iwate-ken no kogai ni kansuru kenkyu, dai15-ho: Miyako-shi no genmai, yasai, oyobi dojo nado no jukinzoku chosa ni tsuite). Text in Japanese. Iwate-ken Eisei Kenkyusho Nenpo (Ann. Rept. Iwate Inst. Public Health), no. 14 (1970):57-77, Dec. 1971. 7 refs.*

In June 1969, the measurement of suspended particulates and metal analysis accidentally uncovered more than 0.1 micrograms/cu m of cadmium in the air. Subsequently, a number of investigations were conducted to see the extent of water and air pollution caused by the stack gas from a factory. The contents of cd, lead, manganese, copper, and zinc were analyzed in unhulled rice and the soil of the rice paddies, vegetables and the soil, and the soil in the vicinity of the factory. A maximum of 3.2 ppm of Cd was found in unhulled rice, and 0.25 to 4.55 ppm (1.22 average) in the rice paddies, but there was no correlation between the contents in the rice and in the paddies. Other Cd contents were 0.13 ppm in scallions, 0.08 ppm in potatoes, 0.05 ppm in cabbage, and 0.8 ppm in the soil. In rice, Pb was found in a relatively high concentration compared with other areas. In newly harvested rice, both Cd and Pb contents were high but Mn, Cu, and Zn were low. The maximum allowable standard of Cd in rice in specially monitored areas is 0.4 ppm, but the total average of Cd in old rice of this area was 0.86 ppm, more than 10 times the average Cd content of polished rice in the entire country.

48442 **APTIC NO. 67141**

Schwabe, Calvin W., John Sawyer, and Wayne Martin

A PILOT SYSTEM FOR ENVIRONMENTAL MONITORING THROUGH DOMESTIC ANIMALS. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronic Engineers, New York; Instrument Society of America, Pittsburgh, Pa.; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 3p., 1971. 3 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1044.)*

A pilot system for environmental monitoring is in its early phases of development in Northern California. It is based upon the existing nationwide Federal-State Market Cattle Testing (MCT) Program for brucellosis in cattle. This program depends upon the collection of blood samples at the time of slaughter from identified cattle. Since the cattle population of California is broadly distributed throughout the state, the pilot system intends to utilize these blood samples to biologically monitor the distribution and intensity of selected environmental pollutants. In a 2-year preliminary trial, the feasibility of retrieving, utilizing for a purpose similar to this, and tracing back to their geographic areas of origin of MCT samples has been demonstrated. (Author abstract modified)

48443 **APTIC NO. 75027**

Suslova, V. V. and V. S. Nikoloyevskiy

EFFECT OF ACID GASES ON THEE PIGMENT COMPOSITION OF THE LEAVES OF TREES AND LAWN PLANTS. *(Vliyaniye kislykh gazov na pigmentnyy sostav yev drevesnykh i gazonykh rasteniy). Uch. Zap., Perm. Gos. Univ., no. 256:93-132, 1971. 22 refs. Translated from Russian, 44p.*

The chlorophyll (I) a and b, carotene (II), lutein (III), violaxanthin (IV), and neoxanthin (V) contents in the leaves of plants which were subjected during various phases of their growth and development to acid gases such as sulfur dioxide, nitrogen dioxide, fluoride, hydrogen fluoride, and phosphoric oxide in various concentrations were studied spectrophotometrically and by paper chromatography. Exposure to the gases caused nonsignificant changes in the pigment content of lawn grasses with different gas resistance. Woody plants revealed an inverse relation between the content of pigments and their gas resistance. The gas- resistant plants contained less pigment and lower Ia/Ib ratios. Differences in the relative distribution of pigments in all plants were nonsignificant. Lawn grasses decreased their pigment content during phases of growth under the influence of acid gases. Pigment system composition in lawn grasses was dependent on SO2 concentration, time of exposure, and species properties. Low concentrations of SO2 during the first day caused pigment decomposition and a decrease of the pigment content on the second day. High concentrations of SO2 stabilized the plant pigments on the first and strongly decomposed them on the second day. Individual and total pigments in nonresistant and medium-gas- resistant woody plants decreased considerably, and increased with an increase of Ia/Ib ratio in the gas-resistant plants. Dependence between the gas resistance and individual and total pigment content in the woody plants was observed. The I and II stabilities in the plants in vitro were low. Statistical calculations revealed a dependence of the xanthophylls and II-IV contents on the gas resistance.

1968

48444 **APTIC NO. 69338**

Fourcy, A. and M. Neuburger

STUDY OF THE INORGANIC COMPONENTS OF PLANTS BY RADIOACTIVATION ANALYSIS. APPLICATION TO THE PHYSIOLOGY OF TRACE ELEMENTS, TO TREATMENT CONTROL, TO POLLUTION, AND RADIO-ECOLOGY. *(Contribution de l analyse par activation a l etude fine de la composition minerale des matieres vegetales. Applications a la physiologie des elements traces, au controle des traitements, aux pollution et a la radio-ecology). Text in French. Bull. Soc. Chemi. France, no. 11:4681-4686, 1968. 46 refs.*

The principle of radioactivation analysis is described, and the possible application of this method to the detection and determination of trace elements in plant materials, including foods and industrial raw materials of vegetable origin, are surveyed. Radioactivation analysis, characterized by high sensitivity and selectivity, is possible either without chemical separation or by separation on ion exchange resins, electrolysis, or selective distillation. Radioactivation analysis is suitable for the detection in plant materials of such elements as manganese, copper, iron, cobalt, zinc, magensium, molybdenum, tungsten, cesium, scandium, sodium, potassium, arsenic, bromine, calcium, barium, rubidium, strontium, lanthanum, as well as fluorine and chlorine, the latter two being present in plant materials as a result of uptake from air.

1962

48445 **APTIC NO. 67041**

Templin, Eugen

ON THE POPULATION DYNAMICS OF SEVERAL PINE PESTS IN SMOKE-DAMAGED FOREST STANDS. *(Zur Populationskynamik einiger Kiefernschadinsekten in rauchgeschaedigten Bestaenden). Wiss. Z. Tech. Univ., Dresden, 11(3):631-637, 1962. 17 refs. Translated from German, Translation Consultants, Ltd., Arlington, Va., 22p. (Presented at the Third International Working Conference of Forestry Smoke Damage Experts, Tharandt, May 24-27, 1961.)*

Population dynamics of bark-hatching and sprout- and bud- infesting insects were examined for smoke-damaged forest stands of Scotch pine in the vicinity of industrial polluters.

The occurrence of Myelophilus piniperda L., Phaenops cyanea F., Rhyacionia buoliana Schiff., and Exoteleia dodecella L. was compared within and outside of the industrial emission areas. The death of pines in the most severely damaged forest stands exposed to fumes and smoke proceeded on a trunk-by-trunk basis, with pronounced individual specific differences in damage being observed. Sharp increases in the infestation of forests near factories by sprout- and bud-infestors were observed, while the proportion of trees infested by bark-hatchers was lower than under similar ecological conditions outside the industrial areas.

1903

48446 **APTIC NO. 69384**

CHLORINE AND HYDROCHLORIC ACID. *(Chlor und Salzsaeure). In: Damage to vegetation by fumes. Handbook for the identification and assessment of fume damage. (Die Beschaedigung der Vegetation durch Rauch. Handbuch zur Erkeunung und Beurteilung von Rauchschaeden. Chapt. 2, p. 230-256. 34 refs. Translated from German. Leo Kanner Associates, Redwood City, Calif., 38p., March 1973.*

The phytotoxic effects of chlorine and hydrochloric acid are reviewed. Topics covered include: industrial sources of hydrochloric acid and chlorine compounds, effects on the soil, effects on the roots of plants, effects on above-ground plant organs, plant morphological changes, and induced changes in plant physiology. Common sources of these pollutants include: ore smelting and refining operations, fertilizer plants, and chemical processing operations. Damage to vegetation results from the action of these pollutants on above-ground organs rather than from indirect action through the soil. The effect of chlorine is sudden and more severe and rapid than that of hydrochloric acid. Hydrochloric acid damage starts at the edge of the leaf, with the leaf tips eventually turning brownish. Chlorine causes bleaching rather than browning, with the leaf surface turning from green to white or yellow. The main plant function affected by hydrochloric acid is that of assimilation. A number of examples of hydrochloric acid- and chlorine-induced plant damage are given from field observations.

EFFECTS-MATERIALS

1975

48447 **APTIC NO. 69352**

Haynie, Fred H.

STATISTICAL PLANNING OF CORROSION EXPERIMENTS AND ANALYSIS OF DATA. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 10p., 1975 (?). 5 refs.*

Various statistical techniques are reviewed in terms of their application and misapplication to the analysis of data from corrosion experiments. Topics covered include: probability distributions, binomial distributions, normal and log-normal distributions, extreme value distributions, data distribution evaluation, factorial and uncontrolled experiments, experimental error and variability determination, and data analysis. Although data from corrosion experiments such as weight loss or gain, thickness lost, corrosion potential, corrosion rate, pitting potential, fraction of area pitted, and number of pits per unit area may have a normal distribution, better results can be produced in some cases by assuming a log normal distribution. Extreme value distributions are used for extreme values such as the depths of deepest pits. Binomial distributions can be applied to experiments that have yes-no type results. Properly designed controlled experiments are much more amenable to statistical analysis of variance than are properly designed uncontrolled experiments.

1974

48448 **APTIC NO. 69454**

Arnold, Charles, Jr.

DECOMPOSITION OF POLYOXYMETHYLENE (DELRIN) AND POLYARYLOXYSULFONE (ASTREL 360) IN THE PRESENCE OF NITROGEN DIOXIDE. *Preprint, American Chemical Society, Washington, D. C., 14p., 1974. 7 refs. (Presented at the American Chemical Society, National Meeting, 168th, Atlantic City, N. J., Sept. 1974.)*

Precision molded parts fabricated with Delrin, an ester end-capped polyoxymethylene polymer, undergo extensive stress corrosion when exposed to nitrogen dioxide. This process was studied on samples of Delrin exposed to NO2-air mixtures in a closed system. Reaction kinetics and mechanisms were determined. A substitute material for Delrin that could be molded into precision parts, Astrel 360, a polyaryloxysulfone, was also tested because of its excellent acid resistance. In flowing streams of NO2-air and NO2-helium, the decomposition of Delrin followed first order kinetics over the decomposition range of 20-90%. The more rapid decomposition of Delrin in NO2-helium versus NO2-air was attributable to the frequency factor rather than the activation energy. The kinetic constants obtained in a flowing system containing NO2 could not be applied to the degradation of Delrin in a static environment. A mechanism for the decomposition of Delrin in the presence of NO2 was proposed involving the acid catalyzed cleavage of the terminal acetate end groups followed by rapid depolymerization of the unstable hydroxyl terminated polyformaldehyde. Under relatively mild conditions, NO2 had no effect on the mechanical properties of Astrel 360 up to 125 C when the NO2 concentration was 0.2%. At higher concentration levels of NO2 (2 and 10%), tensile strength and elongation both decreased but the modulus remained unchanged. At more severe conditions, the extent of degradation was greater. Even after exposure to 10% NO2 at 160 and 215 C for 500 hr, however, the mechanical integrity of Astrel 360 was maintained. Thus, Astrel 360 is a potential replacement for Delrin when the presence of acids or NO2 is anticipated. (Author conclusions modified)

48449 **APTIC NO. 69995**

Gerhard, Jon and Fred H. Haynie

AIR POLLUTION EFFECTS ON CATASTROPHIC FAILURE OF METALS. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Program Element 1AA008, ROAP 21 AMN, Rept. EPA-650/3-74-009, 38p., Nov. 1974. 18 refs.*

NTIS: PB 238 290/AS

The contribution of air pollution to the catastrophic failure of metal structures through the mechanisms of stress-corrosion cracking, corrosion fatigue, and hydrogen embrittlement is reviewed, with failures being cited for bridges, towers, aircraft, and electrical equipment. An economic analysis of these failures indicates that accompanying injury and loss of life account for an annual economic cost of between $50 million and $100 million. No research has been performed to determine the relationships between levels of particular pollutants and the occurrence of catastrophic failure of metals, although agents known to cause metal alloy corrosion problems include nitrates, caustics, hydrogen sulfide, chlorides, sulfur dioxide, ammonia, fluorides, chlorinated hydrocarbons, and cyanides.

48450 **APTIC NO. 70265**

Ichimura, Ichitaro and Keizo Kamiyama

ON THE ATMOSPHERIC CORROSION OF ALUMINUM IN UPPER AIR. *(Joso ni okeru kinzoku (aruminiumu) no* *taiki fushoku ni tsuite). Text in Japanese. Tenki (Weather), 21(5):21-25, May 1974. 1 ref.*

During the spectrum measurement of precipitate particles formed in clouds conducted on Sept. 30 and Oct. 3 and 4, 1968, the severe corrosion of aluminum foil used in the sensor was observed on Oct. 4. The corroded Al was later examined by X-ray diffraction and electron micrographs, and the formation of aluminum hydroxide was detected. The aluminum hydroxide is not readily formed in the atmosphere at normal temperature. Therefore, the existence of strongly corrosive substances in the upper air is probable. As a result of the X-ray diffraction study, large amounts of sulfur and chlorine compounds were found on the corroded surfaces. These large amounts of S and Cl compounds are probably attributable to the emission from Kashima industrial area. However, such pollution is localized and not necessarily wide spread.

48451 **APTIC NO. 68445**

Karasawa, Mikio, Kazuhiro Murayama, and Noriko Choji

FADING OF ANIMOANTHRAQUINONE DISPERSE DYES BY NITROGEN OXIDE. *(Amino antorakinonkei bunsan senryo no sanka chisso gasu ni yoru taishokusei oyobi shoki taishiku seiseibutsu ni tsuite). Text Japanese. Sen I Kogaku (J. Textile Machinery Soc. Japan, Trans.), 30(4):62-68, April 1974. 10 refs.*

The fading behavior and initial products of 15 aminoanthraquinone disperse dyes exposed to dry nitrogen dioxide were investigated using samples of dyed cellulose acetate film, dyed nylon 6 films, and powdered dyes in the gas atmosphere at 5 mm mercury and 25 C. Time dependent absorption spectra gave an isosbestic point indicative of a single reaction product during the initial stage of the dye fading. Elemental analysis, paper chromatography, infrared spectra, and coloration tests identified the primary products from 1,4-diaminoanthraquinone and 1- methylaminoanthraquinone as the 4-diazonium nitrate and the N-nitrosoamine, respectively. The fading was retarded with the dye concentration in the film in most cases.

48452 **APTIC NO. 69473**

Spence, John W., Fred D. Stump, Fred H. Haynie, and James B. Upham

ENVIRONMENTAL EXPOSURE SYSTEM FOR STUDYING AIR POLLUTION DAMAGE TO MATERIALS. *Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Rept. EPA-650/3-74-(APTD no. incomplete), 46p., Dec. 1974. 2 refs.*

A controlled-environment exposure system for studying air pollution damage to materials is described. The system consists of five chambers and includes independent controls for regulating temperature, relative humidity, and concentration of gaseous sulfur dioxide, nitrogen dioxide, and ozone. The system also includes a variable dew/light cycle to achieve accelerated weathering. Prior to initiating statistical exposure studies, differences in lighting and pollutant distribution among the chambers are minimized to below 10% variation for 95% of the measurements. The system is designed so that a continuous single pass movement of air flows through each chamber, thereby preventing possible accumulation of material decomposition products.

1973

48453 **APTIC NO. 69843**

Gacek, Zbigniew

THE ECONOMIC ASPECTS OF THE LINE-INSULATION SELECTION IN THE AREA HAVING HIGHLY POLLUTED AIR. *(Dobor izolatorow liniowych wysokiego napiecia pod wzgledem techniczno-ekonomicznym na terenach uprzemyslowionych). Text in Polish. Zesz.) Nauk. Politech. Slaskiej, Ser. Elek., 402(42):91-101, 1973.*

Guidelines for the selection of line insulation in industrial areas are presented. The total operational cost equals the annual cost of the isolating installation which equals the cost of purchase plus the rate of increased production plus the annual cost of the installation s use plus the annual cost of air pollution control. The mean supply of surface resistivity depends upon the 50% pollution voltage transfer and the highest allowed working voltage. A method is given for establishing the optimum parameters of surface resistivity, and examples are given. Parameters are calculated considering the unreliability of high-voltage line insulation due to pollution effects. Air pollution causes damage to the line insulation and higher costs. In areas of intensive air pollution, special Y and V type insulation systems are most efficient. They consist of normalized long stem insulators. Use of LP 75/17 and LP 75/22 insulators is recommended. Due to increased cost caused by pollution, the optimum insulation of 220 kV lines has reserves of surface resistivity higher by approximately 10% compared to 110 kV lines.

EFFECTS-ECONOMIC

1974

48454 **APTIC NO. 69903**

Allen, M. M., D. J. Hill, and B. H. Walker

PROCESS DEMONSTRATION AND COST ANALYSIS OF A MASS PRODUCTION FORGING TECHNIQUE FOR AUTOMOTIVE TURBINE WHEELS - PHASE I (FINAL REPORT). *Pratt and Whitney Aircraft, West Palm Beach, Fla., Florida Research and Development Center, Office of Air and Waste Management Contract 68-01-0477, Program Element 1AB017, Rept. EPA-460/3-74-023a, PWA Rept. FR-6690, 71p., Nov. 1974.*

NTIS: PB 238 354/AS

The low cost fabrication of integrally-bladed automative turbine wheels utilizing the GATORIZING forging process was demonstrated. Basic forging parameters were developed for the nickel-base alloy IN 100. Several wheels were produced, and post forging heat- treatment studies were conducted to develop an optimum combination of stress-rupture and LCF properties. Target goals for these properties were higher than those achieved in this initial study. The capabilities and limitations of the forging process are defined along with an estimate of turbine wheel cost in large production quantities. The cost data developed can bye used to estimate the probable manufacturing cost of several versions of gas turbine engines in quantities of 100,000 and 1,000,000 units annually so that cost of candidate low-emission automotive engines can be compared to the cost of current piston engines. (Author abstract modified)

48455 **APTIC NO. 69592**

Bouscaren, R. and J.-P. Detrie

EVALUATION OF THE COSTS OF AIR POLLUTION PREVENTION IN THE FRENCH INDUSTRY. THE 1970 SITUATION AND ESTIMATES FOR THE 1971-1975 PERIOD (6TH PLAN). *(Evaluation du cout de la prevention de la pollution atmospherique dans l industrie en France. Situation en 1970 et previsions pour la periode 1971. 1975 (Vie plan)). Text in French. Centre Interprofessionnel, Technique d Etudes de la Pollution Atmospherique (Frence), Environnement Rept. 21, 287p., 1974. 51 refs.*

The investment, operating, and maintenance costs of air pollution control in the French industry exclusive of small-scale operations during the 1971-1975 period is estimated. The estimates are based on the assumption that all new industrial facilities will be equipped with air pollution control devices according to the principle of the best applicable means, and that part of the equipment existing before 1970 would be so equipped. The total costs are high but acceptable. The pollution control measures envisaged will be sufficient to halt the increase of the pollution levels againsg the background of further industiral growth. The price increase conditioned by the air proposed air pollution control measures ranges from 0.1% for kraft pulping to 3.6% for ore agglomerating plants.

48456 **APTIC NO. 69347**

Cain, James T. and Ronald G. Hoelzeman

ENVIRONMENTAL SIMULATION AND ITS POTENTIAL FOR THE ELECTRIC UTILITY INDUSTRY. *Preprint, Pittsburgh Univ., Pa., p. 206-209, 1974 (?). 13 refs.*

The specific problem of air pollution as it interfaces with the electric power industry is discussed. A particular application of simulation which would enable the electric power industry to simultaneously meet the demands for electric power and deal more effectively with the problem of air pollution is presented. Several attempts to reduce pollution are described including a mathematical solution to minimize cost in which the total received load or net power generating requirement is assigned to the individual generating units in a given power system. The state of the art of models for urban air pollution simulation is reviewed, and a possible simulation model for electric utilities is discussed. (Author abstract modified)

48457 **APTIC NO. 70157**

Chance, Barbara J.

RETROFIT: SOME SOCIO-ECONOMIC CONSIDERATIONS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 203-218. 23 refs. (Sept. 25-27.)*

Some socio-economic implications of a retrofit program of motor vehicle emissions control are discussed. The primary economic burden of retrofit devices will be felt by the low socio-economic portion of the population. Such people own the oldest cars, with the average car age for owners with incomes of under $3000 being 7 yr as compared to 4 yr for those with incomes over $15,000. A massive public information program is essential if retrofit programs are to succeed. Estimates of retrofit deterioration to pre-maintenance conditions are as narrow as 12 mo or 10,000 mi. This fact, plus potential oil and gasoline shortages, indicate that a broader solution than retrofit is needed, involving the consideration of alternative engines or modes of travel.

48458 **APTIC NO. 70172**

Chew, Marian F.

COSTS AND BENEFITS AS DECISION CRITERIA IN AIR QUALITY MANAGEMENT. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 501-522. 1 ref. (Sept. 25-27.)*

The use of costs and benefits as decision criteria in air quality management is considered, with specific examples being illustrated for control of automobile pollution control. Air pollutant damages to health and welfare are quantified in terms of dollars at varying levels of air quality (damage function), with each pollutant having a separate damage function. Costs of controlling pollutants are evaluated at similar levels of air quality, with a separate cost function being associated with each pollutant for each source being controlled. Candidates for a program of air pollution abatement must give benefits from control greater than or equal to costs of control. The optimum level of control is the point at which marginal benefits equal marginal costs. A National Academy of Sciences report on benefits and costs of automotive emission control reports that benefits range from 2.5 to 10 billion dollars a year (probably near 5 billion) and that the costs range from 5-12 billion dollars a year. The benefits are concluded to be worth the cost, although such a definite conclusion appears debatable considering the wide range of statistics.

48459 **APTIC NO. 69496**

Cremeans, John E.

CAPITAL EXPENDITURES BY BUSINESS FOR AIR AND WATER POLLUTION ABATEMENT, 1973 AND PLANNED 1974. *Surv. Curr. Bus., 1974:58-64, July 1974.*

The capital expenditures for business for air and water pollution control for 1973 and planned in 1974 are reviewed. Nonfarm business spent $4.9 billion for air and water pollution abatement in 1973 and plans to spend $6.5 billion in 1974. Of this amount, 65% in 1973 and 66% in 1974 went for air pollution control. Five industries accounted for 66% of the 1973 total: electric utilities, nonferrous metals, petroleum, chemical, an/ paper. Four industries spent 10% or more of their capital budgets for air and water pollution abatement: nonferrous metals, paper, blast furnace, steelworks, and petroleum. Four plan to increase their capital spending to 50% or more in 1974: stone, clay, and glass, petroleum, blast furnace, steelworks, and food including beverage. Pollution expenditures were not reduced by pollution regulations. The definition and collection of pollution abatement expenditure data and a questionnaire sent to various businesses to collect thiis data are described. Results of the questionnaire are discussed.

48460 **APTIC NO. 65236**

Fraser, Malcolm D. and Gary J. Foley

COST MODELS FOR FABRIC FILTER SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 15 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-96.)*

Cost models were developed to describe fabric filter system capital and operating costs. The operating cost model is presently only for mechanical shake systems. The models are comprised of the cost of the major subcomponents. Costs are keyed directly to factors in the fabric filter which are the source of its costs, such as the area of its filter surface, type of fabric, pressure drop, and air flow rate. The total capital cost of a fabric filter system is determined from the model by summing the estimated individual costs of the filter s major subcomponents: collector without bags, bags, fans and dampers, various auxiliaries taken as a group, and erection and installation. The oeprating cost model is comprised of maintenance cost, fan power cost, bag replacement cost, and cleaning power cost. The cost models were designed for use in conjunction with recently developed performance models which broadly express fabric filter design and performance in terms of the fundamental physical principles involved. A combination of the performance and cost models provide a tool for analyzing costs involved in designing new or upgrading existing fabric filter systems to meet recent and future more stringent airborne particulate control requirements. (Author abstract modified)

48461 **APTIC NO. 65237**

Hamilton, William F. and Paul A. Boys

CONTROL OF AIRBORNE LEAD EMISSIONS--WHAT S THE COST? *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1974. 19 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-97.)*

The control of atmospheric lead emissions is discussed including estimates of Pb emissions by source; method and cost of control; and an appraisal of the economic impact of Pb removal upon the various sources. The results are based on a literature search of published and unpublished documents; no actual plant contacts were made. Data are presented on increased capital requirements and increased annual costs for the control of Pb emissions from the following sources: municipal incinerators, gray iron foundries, gasoline additive manufacturing, primary Pb smelters, primary copper smelters, storage battery manufacture, primary zinc smelters, secondary Pb smelters, pigment production, lead oxide production, metal can manufacturing, cable covering, brass and bronze production, and automotive Pb emissions. Conventional high efficiency particulate and vapor removal equipment appeared to be economically feasible for new plants that were sources of Pb emissions. Existing plants in industries with declining growth rates may choose closure over control. The domestic petroleum refining industry could afford the cost to comply with existing Federal regulations to reduce and remove Pb from gasoline. Small refiners may experience economic difficulties in complying with the Pb regulations. (Author abstract modified)

48462 **APTIC NO. 69365**

Hill, Lewis E.

THE IMPACT OF ECONOMIC GROWTH AND TECHNOLOGY ON RESOURCES AND THE ENVIRONMENT. *Atlanta Econ. Rev., 1974:52-54, March-April 1974. 16 refs.*

The impact of technology and economic growth on resources and the environment is generally reviewed. Many studies and environmentalists have stated that the world now faces a choice between unlimited economic growth and environmental quality; however, this consensus is challenged. It is argued that technology and economic growth are completely compatible with resource and economic protection, and that technological progress and economic growth are necessary but not sufficient causes of resource and environmental restoration. The tremendous cost of pollution control required to totally eliminate pollution would be astronomical. Therefore, a balance must be made between the costs of pollution control and the benefits. If substantial economic growth can be continued, the growth dividend will provide both a moderate increase in the level of living and adequate protection for the environment. Economic growth can possibly underwrite efforts to preserve the environment. Technology can create new resources and new pollution control methods. Pollutants may be transformed by technology into resources. The creative development and utilization of natural resources and the environment can be used to maintain and improve environmental quality.

48463 **APTIC NO. 69220**

Kajimura, Hideo

REVIEW: FINANCIAL AIDS IN INDUSTRIAL WASTE TREATMENT AND REGENERATION. *(Sangyo haikibutsu shori oyobi sai-shigenka ni taisuru josei sochi ni tsuite). Text in Japanese. Kogyo Yosui (Ind. Water), 193(10):2-7, Oct. 1974.*

Various financial aids to industries for pollution control by federal and local governments and their affiliated agencies are summarized. The aids include tax benefits and loan services to companies for the establishment of pollution control, as well as for plant construction for regenerating useful material from pollutants.

48464 **APTIC NO. 69601**

Nebbia, Giorgio

DETAILED ECONOMIC MODELS OF INDUSTRIAL AND OTHER ACTIVITIES. *Preprint, World Health Organization, Geneva (Switzerland), Regional Office for Europe, 27p., 1974. 77 refs. (Presented at the Regional Residual Working Group, Environmental Quality Management Models, Rotterdam, Netherlands, Oct. 22-25, 1974.)*

Economic-ecologic accounting models of industrial and nonindustrial activities are discussed in relation to their differing requirements from traditional accounting procedures. The development of a branch of environmental statistics is necessary to integrate traditional statistical surveys with environmental information. Information on the exchange of economic commodities is generally available in monetary units, while the exchange of residuals and wastes are in physical units. A waste matrix is developed to describe the flows of matter and energy from the environment, through human activities, and again to the environment during a certain time interval and in a certain region. The identification of environmental indicators through waste matrices appears promising, but it is necessary to develop some sort of yearly gross physical product for describing the physical exchanges and flows of matter and energy through a region during a given year.

48465 **APTIC NO. 69370**

Polinsky, A. Mitchell and Steven Shavell

THE AIR POLLUTION AND PROPERTY VALUE DEBATE. *Preprint, Harvard Univ., Cambridge, Mass., and Urban Inst., 12p., 1974 (?). 10 refs.*

There has been a debate over what constitutes a correct interpretation of econometric studies of the relationship between air pollution and property value. The debate is summarized, and a model of residential location and land rent determination which takes into account the influence of air pollution is described. The model serves as a point of departure for a critical discussion of the debate. The discussion is concerned with the positive issue of the predictability of the new equilibrium schedule of land rents resulting from a change in air quality. It is demonstrated that the regression studies cannot be used for predictive purposes except to the extent that the city is small and there is mobility among cities and that the assignment model cannot be used for prediction in the way that has been suggested. (Author abstract modified)

48466 **APTIC NO. 69198**

Schulz, Gustav and Ludwig Moegele

MEASUREMENT TECHNIQUE BECOMES ECONOMICAL. *(Messtechnik wird wirtschaftlich). Text in German. Umwelt (Duesseldorf), 4(5):18- 22, 1974. 10 refs.*

Measurement technique in environmental protection involves monitoring of emissions and the determination of qualitative and quantitative properties as well as of the spatial distribution of environmental conditions. It spans two large fields: laboratory analyses and environmental monitoring. The net investments by the federal government in West Germany for realization of the environmental program are estimated to reach $9.33 billion over the period 1971 to 1975. Some estimates are higher. It is obvious that investment spendings of these proportions must undergo a cost-benefit analysis. In the case of measurement techniques this is feasible only in few cases. Some examples are the monitoring of combustion processes where the costs for the analyzers are sometimes more than paid by the savings in fuel due to an efficient combustion, or the monitoring of carbon monoxide which prevents contamination of a catalyst. A third example would be exhaust gas monitoring. Through better adjustment of the carburetors automobile emissions can be reduced by 10% creating a cost-benefit ratio of one to two. For emission monitoring expenditures should not exceed 1% of the amount spent for limiting emissions, which in the Federal Republic of Germany is presently $0.66 billion, allowing the erection and operation of 300 measuring stations per year throughout the country. For laboratory analyses the methods of X-ray fluorescence analysis, gas and liquid chromatography proved valuable and widely applicable, which in turn makes these analyses more economical.

48467 **APTIC NO. 69701**

Seki, Tetsuo

ANALYSIS OF THE LINKAGE OF POLLUTION AND INDUSTRY AND THE GENERAL BALANCE THEORY. *(Kogai no sangyo renkan bunseki to ippan kinkoron). Text in Japanese. Mida Gakkai Zasshi (Mida Soc. J.), 67(8):712-725, Aug. 1974. 13 refs.*

Mathematical models are presented for analysis of linkage of pollution and industry, and the theory of balance between supply and demand. Theoretical explanation of W. Leontief s models is given. Derivations of the physical model and the price model (polluters pay principle) are presented. For the internalization of uneconomical externalities (inclusion of pollution in the calculations), an expanded Walras-Cussel model for general balance is formulated. Equations and matrices are presented.

48468 **APTIC NO. 69217**

Torigoe, Kuro

ECONOMIC GROWTH IN RELATION TO ENERGY AND ENVIRONMENT. *(Enerugi to kankyo to keizai seicho ritsu). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):78-84, Nov. 1974. 2 refs.*

The control of sulfur oxides, nitrogen oxides, and oxidant air pollution is discussed from the standpoint of Japanese economy. Capital investment in pollution control should be carefully considered if it does not destroy the Japanese economic growth. For NOx pollution, a tighter restriction on automobile exhaust gas emissions is necessary and similar restrictions for industry will be inadequate. Automobiles contribute 60% of total NOx pollution and about 30% of the capital investment would be required to solve total NOx pollution by the automobile. The most dangerous pollutant is SOx; therefore, solving its pollution problem should have top priority. If products of desulfurization and denitrification could be sold or used to produce other products, capital expenditures for pollution control would not damage Japanese economic growth.

48469 **APTIC NO. 69612**

Wan, E. I. and G. H. Shroff

POTENTIAL MARKET ACCEPTANCE OF ABATEMENT SULFUR BY-PRODUCTS FROM VARIOUS SO2 FGD PROCESSES. *Preprint, American Inst. of Chemical Engineers, New York, 24p., 1974. 7 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Washington, D. C., Dec. 1-5, 1974, Paper 74d.)*

The potential market acceptance for various sulfur by-products from sulfur dioxide flue gas desulfurization processes is examined using a production-distribution model. The assessment is based on expected production and regional demands for abatement sulfur by- products paralleling the 1975-2000 power generating trend in the Mid-Atlantic Area Council region. Although there appears to be a potential market for the recovery flue gas desulfurization processes in the MAAC region, the supply of abatement sulfur is expected to exceed the market demand in the early 1980 s. Thus, after 1985, greater use of throwaway processes should be considered to prevent a sudden surplus of abatement sulfur. Technology in recovery of elemental sulfur is projected to be not fully developed until the early 1980 s. Additionally flue gas desulfurization recovery processes producing elemental sulfur are generally cost prohibitive and cannot compete with throwaway processes. The transportation method and the distance between supplier and purchaser will heavily influence the recovery economics of abatement acid. In the MAAC region, abatement acid is economically feasible for pentration of markets within a 100-mile radius. The relative economics of recovery flue gas desulfurization processes will encourage power plants to burn high sulfur fuel. This condition will maximize the overall profit when the local market demand is not exceeded. (Author conclusions modified)

48470 **APTIC NO. 69669**

Wilson, D. G.

ESTIMATES OF POLLUTION FROM U. S. NON-FREIGHT HIGHWAY TRANSPORTATION. *Int. J. Environ. Studies, vol. 6:35-50, 1974. 27 refs.*

Forecasts to the end of the century on the future use of resources and the future generation of various pollutants as a result of different proportions of the use of private automobiles and public transportation are made. The effects are extended to supporting industries such as steel, cement, and coal. Relative transportation pollution costs for an urban area are modelled. Even a 50% diversion of automobile commuting to bus commuting would not have a dramatic effect on overall resource utilization and pollution, but would have a marked effect on the heavy pollution costs of central cities. A system of inspection and road-use charges is proposed. (Author abstract)

48471 **APTIC NO. 69358**

Real Estate Research Corp.

THE COSTS OF SPRAWL. *Council on Environmental Quality, Washington, D. C.; Office of Policy Development and Research, Washington, D. C., Department of Housing and Urban Development; and Environmental Protection Agency, Washington, D. C., Office of Planning and Management, 284p., April 1974. 92 refs.*

GPO

Quantitative and qualitative estimates of the environmental and socio-economic costs associated with alternative patterns of residential land development at the neighborhood and community level are presented. Emphasis is placed on costs associated with developments commonly proposed for the urban fringe of metropolitan areas. A neighborhood cost analysis of air pollution (particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides) is tabulated for single-family conventional, single-family clustered, townhouse clustered, walk-up apartment, high-rise apartment, and mixed (20% of each) housing patterns (1000 units). It was assumed that 2/3 of the housing units used natural gas power, and the remaining 1/3 electricity. Air pollution cost analyses are also presented at the community level, with automobiles and natural gas use being the pollutant sources considered. Community development patterns (10,000 units) assessed are: planned mix, combination mix, sprawl mix, low density planned, low density sprawl, and high density planned. Emission estimates are derived from emission factors. Hydrocarbons, CO, and NOx were estimated for auto emissions.

48472 **APTIC NO. 69904**

Kearney (A. T.), Inc., Chicago, Ill.

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES, FERROALLOYS INDUSTRY (FINAL REPORT). *Environmental Protection Agency Contract 68-01-1545, Rept. EPA-230/2-74-009, 122p., June 1974.*

NTIS: PB 234045

The economic impact of water pollution abatement on selected segments (ferromanganese, ferrosilicon, ferrochromium, and silicamanganese) of the ferroalloys industry is summarized. Industry structure, financial profile, sources of water pollution, projected costs and price increases, and effects on production, plant closings, and local communities are discussed. Air pollution control requirements now under development are of major concern to the industry, since air pollution costs are expected to have a greater impact on the industry than the anticipated costs of water pollution abatement, which are expected to be minor. Wet-type air pollution control equipment waste water and cooling water used by dry air pollution control systems will be the primary sources of water pollution. Thirty-two percent of the industry capacity is controlled by wet-type air pollution control systems, 38% by dry-type systems, and 30% has no air pollution control systems but will probably install dry systems. The impact due to water pollution abatement costs on those plants using wet-type control systems will be much greater than the impact on plants which do not. The impact of 1977 and 1983 air pollution standards (best practicable technology) on costs, water pollution, and plant closings are reviewed.

1973

48473 **APTIC NO. 69626**

Fant, B. T.

HOW NEW TECHNOLOGY CAN REDUCE PROCESS COSTS. *Preprint, American Inst. of Chemical Engineers, New York, 22p., 1973. 4 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 11-15, 1973.)*

Desulfurization of heavy fuel oils to meet rapidly increasing low-sulfur fuel oil markets will be one of the major challenge facing the refining industry during this decade. Factors affecting desulfurization costs and areas where new technology can be expected to reduce those costs are discussed. Most refiners have chosen indirect, or vacuum gas oil, desulfurization to produce low-sulfur fuel oils. This route is limited when it is necessary to process heavy crudes to meet low sulfur specification on the total fuel oil pool. Direct desulfurization of 650-700 F atmospheric residua offers a route for greater reduction in fuel oil pool sulfur levels. Severe processing of the resid is required to meet low-sulfur fuel oil specifications. Deep desulfurization of residua has been demonstrated in recent long-term Residfining pilot plant operations. Direct desulfurization costs are compared to those for indirect desulfurization. The cost of Residfining increases with the desulfurization level. Cost data are shown for both a high-sulfur Arabian heavy crude and medium sulfur Arabian light. With both crudes, Gofining is the cheapest desulfurization route for sulfur reductions in the fuel oil pool corresponding to 30-45%. If greater reductions in the fuel oil pool sulfur content are desired, direct desulfurization via Residfining is required. At present direct desulfurization is technically feasible but relatively expensive. The major factors contributing to desulfurization costs are the hydrogen and the catalyst required. Pressure is the most significant variable affecting hydrogen consumption. The optimum pressure depends upon catalyst properties. Some process innovations have been developed which reduce hydrogen consumption and catalyst requirements. The feed quality has the most impact on catalyst requirements, and thus a major impact on the cost of desulfurization. The asphaltene content of several common residua is listed, and the RT-2 catalyst which has a unique ability to handle asphaltenes is described. Continued cost reductions can be expected because of improved catalysts and processing techniques.

48474 **APTIC NO. 69607**

Garrison, Charles B. and Harold W. Henry

MEASURING AND MINIMIZING THE SOCIAL COST OF ENVIRONMENTAL POLLUTION (PARTIAL FINAL REPORT). *Tennessee Univ., Knoxville, College of Business Administration, National Aeronautics and Space Administration Grant 43-001-021, 43p., Jan. 29, 1973. 3 refs.*

NTIS: N74-22591

Top executives of 53 privately-owned industrial corporations and one government-owned corporation were successfully contacted in an effort to evaluate the total impact of environmental protection on major industrial segments of society. Most of the companies were in the automobile, petroleum, chemical, paper, non-ferrous metals, steel, and electric utility industries. Environmental protection efforts, in addition to satisfying new legal requirements of pollution control, were viewed by many respondents as an extension of the growing emphasis on corporate social responsibility. The major impact of pollution control on the corporations was increased capital investment for facilities to reduce air and water pollution. The average capital expenditure per firm was $14.8 million in 1971 and an estimated $21.9 million in 1972, accounting for about 10-15% of the capital budgets in these companies. A large increase in research and development spending was reported as well as the formation of many new staff departments and executive positions for pollution control efforts. Air and water pollutants were the primary concerns of the companies.

48475 **APTIC NO. 69357**

Grommers, Frances, James Mahoney, and Melvin First

A SIMULATION MODEL FOR SOLID WASTE MANAGEMENT. *In: Municipal Waste Disposal by Shipborne Incineration and Sea Disposal of Residues. (Final Report). Harvard Univ., Boston, Mass., School of Public Health, Environmental Protection Agency Grant U1-00557, Rept. EPA-670/2-73-017, p. 545-582, 1973. 9 refs.*

NTIS: PB 2[illegible]1684

A waste management simulation model for planning combined land- and ocean-based disposal methods is presented for the 25-year time period of 1965-1990, with particular reference to the metropolitan Boston area. The model simulates combinations of disposal options and computes the resulting net cost of these options to the community based on cost and benefit estimates, represented by monetary units and air pollution abatement. Disposal methods considered include: land-based incinerators, sanitary landfills, shipborne incineration, and disposal of residues at sea. The contribution of an incinerator ship to total waste disposal costs and benefits is significant when the cost of this method is equal to or lower than land incineration. An analysis of the costs generated by air pollution constraints indicates that such constraints have much less effect on the total 25-year costs than changes in land constraints. The average increase due to air pollution cost (when there is 1000 acres of land available) is approximately 6 million dollars over the 25-year model period.

48476 **APTIC NO. 70129**

Hirst, Eric

POLLUTION CONTROL ENERGY COSTS. *Preprint, American Society of Mechanical Engineers, New York, 12p., 1973. 39 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/Ener-7.)*

The amounts of energy needed for or saved by operation of several environmental protection strategies are examined. The areas considered include: urban passenger traffic, waste water treatment, solid waste management, air pollution control, and waste heat dissipation. The energy required to meet the environmental needs discussed -- based on the limitation and assumptions in this study -- are small relative to total energy use. The specific scenarios analyzed include: a 10% shift from urban automobile traffic to mass transit, adoption of automobile pollution control devices to meet clean air standards, redesign of automobiles to improve fuel economy, secondary-level sewage treatment for all waste water, disposal of all solid waste by landfilling, production of electricity for incineration of 10% of total solid waste, 1/3 production of steel, aluminum, and paper from recycled scrap, control of sulfur and particulate emissions from stationary sources, and use of cooling towers at half of all power plants. These scenarios would result, respectively, in 320 trillion Btu energy savings, 1100 trillion Btu increase, 1100 trillion Btu savings, 290 trillion Btu increase, 75 trillion Btu increase, 290 trillion Btu savings, 440 trillion Btu savings, 840 trillion Btu increase, 160 trillion Btu increase, and 160 trillion Btu increase. These conclusions in regard to primary energy closely correspond to those for electric energy. (Author abstract modified)

48477 **APTIC NO. 69935**

Mikhail, Azmi D.

CAPITAL BUDGETING FOR POLLUTION CONTROL. *J. Gen. Manage., 1(1): 32-44, 1973. 14 refs.*

Capital budgeting practices for pollution control expenditures were studied by a survey of four American industries: paper and pulp manufacturing, steel, electric utilities, and integrated oil. Two main areas of enquiry were the focus of the study. The first dealt with the realization of identifiable benefits from pollution control projects: their sources, magnitudes, patterns, and degree of certainty. The second dealt with the relevance of normally accepted cost-benefit analysis to such unconventional expenditures. The survey was conducted using a questionnaire sent to various companies in the four industry groups. Several firms reported that they had obtained identifiable and measurable benefits from pollution control expenditures. Positive response was highest for paper and pulp (70%), closely followed by integrated oil (65%). Except for electric utilities, the sources of benefits mentioned most were higher product yield realized and salable by-products. For the electric utility group, reduction of litigation costs as a source of benefit was singled out, but other sources of benefits were cited which added up to a sizable percentage of total sources. A majority of responding firms stated that pollution control projects are not amenable to conventional cost-benefit analysis. There was no unanimity among respondents regarding many points.

48478 **APTIC NO. 67114**

Reneker, Robert W., Robert J. Fleming, Edward H. Carson, Clifton B. Cox, Harold N. Kummer, Kenneth W. Monfort, and Floyd A. Segel

POLLUTION CONTROL COSTS AND RESEARCH PRIORITIES IN THE ANIMAL SLAUGHTERING AND PROCESSING INDUSTRIES. *National Industrial Pollution Control Council, Washington, D. C., Poultry and Animal Based Products Foods Sub-Council, 28p., May 1973.*

GPO

The cost for complying with existing and proposed pollution control regulations was surveyed by the major trade associations in the meat, poultry, and rendering industries. From 1971 to 1976 these industries estimate a total capital investment for pollution control of $222 million and a total operating and administrative cost exceeding $162 million. The major atmospheric pollutants are odor, smoke, and particulates. Using 1971 and 1972 as a base, the average annual capital investment in pollution control in these industries will increase by 40% from the base for the years 1973 through 1976. The average annual operating and administrative costs for these services will increase by 93% from the base for the same period. A minimum of 124 rendering and poultry slaughtering plants may be forced to close at a capital costs of approximately $23 million and with considerable socio-economic impact on employees and the community. These are primarily small plants located in rural areas. (Author summary modified)

48479 **APTIC NO. 69391**

Smith, G. Louis

EFFECTS OF POLLUTION ABATEMENT ON WORLD DYNAMICS. *Preprint, 7p., 1973. 2 refs. (Presented at the Summer Computer Simulation Conference, Montreal, Canada, July 17-19, 1973.)*

Two previous studies of the world system have been made in which interactions of the world s population, industry, agriculture, natural resources, and pollution were considered. The results of both studies indicated that due to a depletion of natural resources, there will be a decline of the world system. With increased natural resources, these studies indicate that increasing pollution will cause a cataclysm. These results were obtained because the limits to growth of pollution were not included. A modification of the world dynamics model which accounts for pollution abatement is presented, and results obtained from this model are given. The model assumes that as pollution increases, efforts as measured by capital invested for pollution abatement are made to control pollution. There is a competition between food supply, material standard of living, and pollution abatement for capital; and time is required for diversion of capital toward pollution abatement. Time histories have been computed with the world model modified by the addition of a pollution abatement sector. Inclusion of pollution abatement in the model drastically alters the response of the world system. Instead of undergoing a pollution catastrophe, all system levels go more or less smoothly toward an equilibrium. Pollution also increases, to the level that will be tolerated. The fraction of capital which is required to keep pollution at this level is relatively small, and has little adverse effect on the material standard of living. Thus, although pollution is a problem, it can be brought under control and need not cause a collapse of the world system. (Author abstract modified)

48480 **APTIC NO. 69655**

Smith, G. Louis

INTERACTION OF POLLUTION ABATEMENT WITH WORLD DYNAMICS. *National Aeronautics and Space Adminstration, Hampton, Va., Langley Research Center, NASA Technical Memorandum X-2832, Work Unit 790-91-02-03, Rept. L-8961, 39p., Oct. 1973. 3 refs.*

The world dynamics model of Jay W. Forrester is modified to account for pollution abatement. In the modified model, it is assumed that as pollution increases, efforts are made to control pollution. There is a competition between food supply, material standard of living, and pollution abatement for capital, and time is required for diversion of capital toward pollution abatement. Inclusion of pollution abatement in the model drastically alters the response of the world system for the case in which depletion of natural resources is not considered. Instead of undergoing a pollution catastrophe, all system levels move more or less smoothly toward an equilibrium. A FORTRAN program listing of the modified world dynamics model is included. (Author abstract)

48481 **APTIC NO. 67118**

Zupan, Jeffrey M.

THE DISTRIBUTION OF AIR QUALITY IN THE NEW YORK REGION. *Washington, D. C., Resources for the Future, Inc., 1973, 101p. 25 refs.*

The quality of air in the New York Region, a 31 county tristate area centered on Manhattan, is examined in an attempt to determine how differing air quality affects different income groups. Estimates are also made of air quality exposure in different income groups for various land use alternatives and highway programs within the context of increasingly stringent federal emission standards. Direct air quality measurements and isopleths are provided to assign average concentrations for each of four air quality indicators (sulfur dioxide, smokeshade, settleable particulates, and suspended particulates) to the postal zone system for which income data are available. Curves for each income group and each indicator are drawn, showing the percentage of the population exposed to successively higher concentrations of each air quality indicator. In each case, the low income population is consistently exposed to higher concentrations of pollutants than the middle and high income populations, with the middle income population being exposed to higher concentrations than the high income population.

1972

48482 **APTIC NO. 67109**

Barrett, Larry Boyd

IMPACT OF AIR POLLUTION CONTROL ON GRAY IRON FOUNDRIES: AN ECONOMIC ANALYSIS. *AIChE Symp. Ser., 68(126):216-220, 1972. 2 refs.*

The economic impact of air pollution control on gray iron foundries was investigated. They emitted more than 170,000 tons of particulates in 1968 and the industry ranked as one of the top 15 polluting industries. Of firms with more than $10,000,000 in shipments, 65% have air pollution control. Smaller firms tend not to have air pollution control, and only 3% of the foundries with shipments under $.5 million operate control systems. An engineering and economic survey was made of representative foundries with pollution control. Supplemental statistics were gathered from government sources on economic and financial aspects of the industry and over a representative sample of firms. In terms of impact on profits, capital stock, and value of shipments, foundries with less than a million dollars in shipments face approximately five times the impact of pollution control than that on large foundries with shipments over $10 million. There is little evidence to suggest that air pollution control is a major burden to the existing foundries or the primary factor in the demise of other foundries. (Author abstract modified)

48483 **APTIC NO. 69460**

Cumberland, John H. and Bruce N. Stram

AN INTERINDUSTRY APPROACH TO MODELING ECONOMIC-ENVIRONMENTAL STUDIES. *Inst. of Electrical and Electronics Engineers, 25p., 1972. 7 refs. (Presented at the IEEE (Institute of Electrical and Electronics Engineers) Conference on Decision and Control, New Orleans, La., Dec. 15, 1972.)*

A three-stage accounting procedure for providing information required in the analysis of economic-environmental relationships is described. The system is based on a materials balance concept. The accounting structure consists of the following linked stages of the emissions process: the generation and identification of residual material; initial disposition of the residual material; and disposition of treatment residual. The first stage contains only one accounting category, viz., gross residual. This category is fundamental to any modeling of the emissions process. The second stage of the process is categorically divided into internally treated gross residual, untreated discharge to the environment, and gross residual transferred to external contractors. Treatment processes constitute the third stage of the emissions process. The treatment processes undertaken by a specific activity may be directed toward processing internally generated residual, residual transferred from other activities, or both. An additional category of treated residual is recycling. Data corresponding to the accounting format are presented for about 70 industries and include about 130 categories of pollutants for base year 1967.

48484 **APTIC NO. 67042**

Naegele, John A., William A. Feder, and C. Jeffrey Brandt

ASSESSMENT OF AIR POLLUTION DAMAGE TO VEGETATION IN NEW ENGLAND. JULY 1971 - JULY 1972. FINAL REPORT. *Massachusetts Univ., Waltham, Suburban Experiment Station, Air Pollution Control Office Contract 68-02-0084, Program Element A11004, Rept. EPA-R5-72-009, 14p., Aug. 1972. 7 refs.*

NTIS: PB 214161

A regional survey of New England was conducted to determine the economic losses to the agricultural industry from injury caused by air pollutants. Investigations were performed in 40 counties of the six New England states. Direct air pollution injury was observed in 14 counties, with greatest economic losses being associated with vegetables, fruits, and agronomic crops. Direct economic losses were estimated at $1.1 million for the 1971-72 season. Oxidants accounted for the largest proportion of losses, with damage therefrom amounting to an estimated $1.045 million. Losses from sulfur dioxide and ethylene pollution were estimated at $76 thousand and $14 thousand, respectively. A tabulation was made of specific crops affected by particular pollutants.

48485 **APTIC NO. 65489**

Sommerlad, Robert E. and Peter J. Adams

PITFALLS OF FORECASTING SO2 REMOVAL COSTS. *American Assoc. of Cost Engineers, Am. Assoc. Cost Engrs., Natl. Meet., 16th, Trans., Liberty, N. Y., 1972, p. 73-76. (June 25-28.)*

The removal of sulfur dioxide from combustion gases is described. National standards for large power plants are 0.1 lbs/million Btu for particulates, 1.2 lbs/million Btu for sulfur dioxide, and 0.7 lbs/million Btu for nitrogen oxides. These standards require the development of efficient SO2 removal systems. Some possible systems are described, including a particulate and SO2 scrubber, a combined electrostatic precipitator and SO2 scrubber, and a combined electrostatic precipitator and dry adsorption system for SO2. Accurate estimates of capital and operating costs for SO2 removal systems are necessary, but are difficult to arrive at. There are many pitfalls in producing these estimates which are discussed. Estimated capital and operating costs in $/kw and times 10 to the 6th power $/yr, respectively, are 29.60 and 12.3 for a particulate and SO2 scrubber, 36.90 and 13 for a combined electrostatic precipitator plus a SO2 scrubber system, and 34.90 and 12.1 for a combined electrostatic precipitator and dry adsorption system.

48486 **APTIC NO. 69794**

Stairmand, C. J.

POLLUTION CONTROL - HOW FAR CAN WE GO? *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-10, Part 2, p. 1-24, 1972. (Presented at the National Society for Clean Air Annual Conference, 39th, Scarborough, England, Oct. 16-20, 1972.)*

The improvement of air quality in England and present pollution problems in England are reviewed. Sources of pollution, legal aspects, the Alkali Inspectorate's method of controlling pollution, costs of pollution control, and cost-effectiveness optimization of pollution control programs are reviewed. A discussion of the paper is included.

48487 **APTIC NO. 69360**

CHEM Systems, Inc., New York

DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS, LOW-SULFUR FUEL FROM COAL. VOLUME I. ENGINEERING STUDIES. PART 3. COG REFINERY ECONOMIC EVALUATION. PHASE II. *Office of Coal Research Contract 14-01-0001-496, Pittsburgh and Midwny Coal Mining Co. Rept., SRC Process Rept., Rept. OCR-53-4, 158p., Jan. 1972. 1 ref.*

NTIS: BP 234043

The conceptual design and economics of a proposed process involving the combination of solvent refining with other conversion processes for the production of oil and gas from coal are evaluated. The total investment required for the process, including working capital and a coal mine for 19.3 million tons/yr of coal, is $785 million. Based on a pipeline gas price of $.75/MM BTU and $4.50/Bbl for light refinery liquid, a discounted cash flow return on investment of 10% (after tax) is obtained. Variations in the coal preparation and gasification scheme which would improve overall economics include: elimination of the final hydrotreating step, lower pressure and lower hydrogen concentration in hydroconversion and hydrotreating, elimination of filtration, and the use of a fixed bed hydroconversion reactor. Comparison of the COG (coal, oil, gas) refinery economics to other coal gasification processes indicate that the COG refinery can produce synthetic natural gas a price significantly below the other processes.

1970

48488 **APTIC NO. 69922**

Pittsburgh and Midway Coal Mining Co., Kansas City, Mo.

ECONOMIC EVALUATION OF A PROCESS TO PRODUCE ASHLESS, LOW-SULFUR FUEL FROM COAL (INTERIM REPORT). *Office of Coal Research Contract 14-01-0001-496, Rept. OCR-53-1, SRC Process Rept., 150p., March 1970. 9 refs.*

NTIS: PB 234040

A coal preparation technique (solvent refining) developed by the Pittsburgh and Midway Coal Mining Company for the production of ashless, low sulfur fuel from coal for use by power plants in areas where sulfur dioxide emission restrictions exist was economically evaluated. The evaluation was based on a 10,000 ton/day de-ashing plant located at a mine-mouth power plant in the Ohio-Illinois-Kentucky area. The basic objective of the evaluation was to determine the selling price of the de-ashed coal product required to yield an adequate return on capital investment. Three different process schemes were evaluated: the use of all the de-ashed coal product as fuel, coking 10% of the de-ashed coal product to produce electrode carbon and using the remaining de-ashed coal as fuel, and coking 25% of the de-ashed coal for electrode carbon production with the remaining 75% being used as power plant fuel. The estimated required selling price of the de-ashed coal product delivered as a liquid directly to an adjacent power plant was 29.5 cents/mm BTU for the first case, 27.7 cents for the second case, and 19.5 cents for the last alternative. The required selling prices for delivery in solid form for each of the three cases, respectively, were: 31.6, 29.9, and 22.1 cents/MM BTU. Hence, the addition of a coking unit to make electrode coke from a portion of the de-ashed coal product appears to be economically attractive. The use of de-ashed coal in new power plants will result in lower operating and investment costs, notwithstanding the elimination of sulfur dioxide control requirements.

STANDARDS AND CRITERIA

1974

48489 **APTIC NO. 65672**

Baumann, R. and J. Schelding

SULPHUR DIOXIDE - A COMPILATION OF IMMISSION LIMITS, LIMIT VALUES IN WARNING AND ALARM SYSTEMS. *(Schwefeldioxid - eine Zusammenstellung von Immissionsgrenzwerten, Grenzwerten in Warn-und Alarmsystemen). Text in German. Umweltschutz Staedtereinig. (Vienna), 1974 (5):107-112, 1974. 25 refs.*

A compilation of sulfur dioxide emission limits in effect in the Federal Republic of Germany, Canada, the German Democratic Republic, the Netherlands and the United States, Bulgaria, Finland, France, Israel, Italy, Japan, Yugoslavia, Poland, Romania, Sweden, Switzerland, Czechoslovakia, Turkey, and USSR is given. The World Health Organization is concerned with setting limit values for atmospheric pollutants. The WHO distinguishes between four levels of concentrations and exposure times. The concentrations of level I caused neither direct nor indirect effects on humans and plants, those of level II cause irritation of the sense-organs, reduction of the visibility, and harmful effects on plants. From an unpublished draft of the WHO of 1971 the following SO2 limits were taken. For level I the annual arithmetic average of the 24-hour values is 0.050 mg SO2/cu m, the 24-hour maximum value is 0.075 mg SO2 per cu m, and the 1-hour maximum value is 0.150 mg SO2/cu m. For level II the annual arithmetic average value from the 24-hour values is 0.075 mg SO2/cu m, the 24-hour maximum value is 0.150 mg SO2, and the 1-hour maximum value is 0.350 mg SO2/cu m. Deviating from this concept, the WHO published in 1972 limit concentrations representing the long-term goal which the individual countries should try to arrive at. These limit concentrations are 0.06 mg SO/2cu m as annual average and 0.20 mg SO2/cu m as diurnal average. In addition, limit concentrations representing air quality emergency standards effective in Japan, North Rhine Westphalia (Federal Republic of Germany), the Rijnmod-Area (The Netherlands), and the United States are discussed.

48490 **APTIC NO. 69279**

Henschler, D.

PROBLEMS OF MAXIMUM ACCEPTABLE CONCENTRATIONS OF RESPIRABLE NOXIOUS GASES IN PLACES OF WORK AND AMBIENT AIR. *(Zur Problematik der Grenzwerte (MAK, MIK) bei inhalativen Noxen). Text in German. Pneumonol. (Berlin), 150(2-4):77-82, 1974.*

The shortcomings in the field of threshold limit values of airborne contaminants were studied. They arise in setting up limits and in practical applications; in determination of what is health- impairing; in predictive values of animal experiments which are debateable because of differences in the airway structure, absorption, metabolism, distribution, and excretion of substances. Other drawbacks are: changes in type and site of toxic actions with concentration and time of exposure; difficulties in the definition and evaluation of no-effect levels, especially with carcinogenic and mutagenic materials; and lack of relevant data on many industrial chemicals from laboratory and/or human experiences. Misuse in the application of threshold values may arise from restrictive use by legislation, inaccurate calculations in the case of combined exposure to different chemicals, inadequate analytical control of the workplace atmosphere, and extrapolations from 8-hour exposure values to high concentrations and shorter periods. The essential groundwork for working out maximum allowable emission concentrations stems from experiences at the working place. The basic difference of the two limit values must not be overlooked, however. The maximum allowable emission concentrations are for the entire population, including sick persons, children, and oversensitive people.

48491 **APTIC NO. 65241**

Hovey, Harry H., Howard C. Jones, and William N. Stasiuk

DEVELOPMENT OF SHORT-TERM AIR QUALITY STANDARDS FOR SUSPENDED PARTICULATE MATTER IN NEW YORK STATE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 9 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-102.)*

The development of short-term air quality standards for suspended particulate matter in New York State is described. The Clean Air Act of 1970 requires each state to submit plans for implementation, maintenance, and enforcement of National Ambient Air Quality Standards subsequent to promulgation. Air quality standards for averaging times shorter than 1 yr are needed to shorten the time required to show contravention and to provide a basis for early corrective measures to regulate specific sources. Daily suspended particulate data was analyzed by the Kolgomorov-Smirnov method goodness-of-fit technique to determine that the form of the distribution was log normal. A method developed by Larsen for predicting short-term maximum concentrations of log normally distributed data was used to determine numerical values for 1, 2, and 3-month standards. A graphical approach was also used with equivalent results. Monthly, bi-monthly, and tri-monthly suspended particulate standards of 125 micrograms/cu m, 110 micrograms/cu m, and 100 micrograms/cu m, respectively are proposed for the most extensively developed areas of New York State and correspondingly lower values for other areas. The methods are generally applicable to other air contaminants. (Author abstract modified)

48492 **APTIC NO. 66988**

Huenigen, Edmund and Juergen Sachse

OBJECTIVE EVALUATION CRITERIA FOR EMISSIONS AND MEASURES FOR THEIR REDUCTION. *(Objektive Bewertungskriterien fuer Emissionen und die Massnahmen zu ihrer Verminderung). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm. Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 92-108. 7 refs.*

Objective evaluation criteria for waste gas components and for measures aimed at reduced emissions of injurious pollutants have been formulated. They allow the determination of which measures are most efficient and economical. Air-hygienic valency is a criterion of the relative proportion of a given component in the total toxicity of a waste gas. Application of this criterion to diesel engines shows that nitric oxide is the most important component and that limitation of smoke density alone will no longer be sufficient. For spark ignition engines lead and carbon monoxide are most important and hydrocarbons are only of minor importance. The air-hygienic effectiveness of a given control measure allows an objective measurement of its effectiveness from the point of view of health effects. An example of its application shows that the effectiveness of afterburning for diesel engines has been overestimated. Methods for the formulation of standards are also given.

48493 **APTIC NO. 68423**

CONCAWE, The Hague (The Netherlands), Secretariat

LIGHT DUTY GASOLINE ENGINE VEHICLE EMISSION REGULATIONS. *In: Existing Environmental Regulations of Concern to the Oil Industry in Western Europe. Rept. 7/74, Nov. 1974, p. 3.1-3.2. 2 refs.*

The United Nations-Economic Commission for Europe Regulation 15 is outlined for carbon monoxide and unburned hydrocarbons. Current and Oct. 1975 effective exhaust emissions are presented for light duty gasoline engine vehicle weights. The ECE regulation for crankcase emissions was set of 0.15 wt% of fuel supplied. The ECE regulation for exhaust emissions and crankcase emissions are effective in Austria, Belgium, France, Germany, Italy, Netherlands, Norway, and Spain. They are proposed for Czechoslovakia, Finland, Hungary, Yugoslavia, and Denmark. Denmark now has CO emissions limits set at 4.5% at idle, 1% tolerance. In Sweden the CO limit is 45 g/km max and the unburned hydrocarbon limit is 2.2 g/km max. No crankcase emissions are allowed. Beginning with 1976 models, the 1973 United States Federal limits will apply. The United Kingdom follows ECE Regulation 15 for exhaust emissions, but permits no crankcase emissions. Switzerland has no CO limits, but follows ECE for unburned hydrocarbons and crankcase emissions.

48494 **APTIC NO. 69442**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: PHOSPHATE FERTILIZER INDUSTRY VOLUME 1: PROPOSED STANDARDS (FINAL REPORT). *EPA-450/2-74-019a, 143p., Oct. 1974. 34 refs.*

NTIS: PB-237 606/AS

Background information and bases for performance standards proposed for the phosphate fertilizer industry are presented. Standards are proposed for these process facilities: wet-process phosphoric acid (WPPA), superphosphoric acid (SPA), diammonium phosphate (DAP), run-of-pile triple superphosphate, granular triple superphosphate production, and granular triple superphosphate storage. The proposed standards require control at a level typical of well-controlled existing plants and attainable with existing technology. The levels were determined by extensive on-site investigations, design factors, maintenance practice, available test data, and the character of emissions. Costs for control of fluoride emissions for WPPA, SPA, and DAP manufacturing are minor, amounting to less than 1% in sales price at the wholesale level. Costs for the emission control for run-on-pile triple superphosphate is about 2% of the wholesale price, and for granular triple superphosphate, 4%. (Author abstract modified)

48495 **APTIC NO. 69700**

SPECIAL COMMITTEE REPORT ON ENVIRONMENTAL STANDARDS FOR NITROGEN OXIDES. *(Chisso sankabutsu ni kakaru kankyo mokuhyochi to ni tsuite no senmon bukai hokoku). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(6):25-35, Nov. 1974.*

Regulations concerning total amount of emission of nitrogen oxides were studied by a special committee, at the request of the Kawasaki Pollution Control Council, with the object of establishing environmental standards for nitrogen oxides. Recommendations were made. Pollution simulation was calculated in accordance with conditions unique to Kawasaki. Emission data for NOx were based on data collected in 1972 by various governmental agencies (federal, Tokyo, and Kawasaki). Diffusion simulation calculations produced numbers applicable to various regions of Kawasaki for stationary and itinerant pollution sources. The goal for NOx emission control is a 24-hour average value of below 0.02 ppm. The interim value (for 1978) is set below 0.04 ppm. Attainment of the goals is dependent on enforcement of federal pollution regulations. Implementation of NOx pollution control in Kawasaki also necessitates an active approach to regulation of trash incineration.

48496 **APTIC NO. 69897**

Office of Air and Waste Management, Research Triangle Park, N. C., Emissions Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: ELECTRIC ARC FURNACES IN THE STEEL INDUSTRY. VOLUME 1: PROPOSED STANDARDS (FINAL REPORT). *Rept. EPA-450/2-74-017a, 179p., Oct. 1974. 41 refs.*

NTIS: PB 237840/AS

Background information and the rationale used in the development of proposed standards of performance for electric arc furnaces in the steel industry are given. The economic and envirommental impacts of the standard are discussed. The use of electric arc furnaces in the steel industry is described and emissions are discussed. The particulate and opacity standards are described. Emission control may be accomplished by direct shell evacuation systems in combination with natural ventilation through the open roof, building evacuation in a shop with a sealed roof, canopy hoods in a shop with a sealed roof, canopy hoods in combination with natural ventilation, and a combination of several methods. Impacts of the proposed standards on air pollution, water pollution, solid waste, noise pollution, and energy considerations are described. The procedure for developing standards, particulate and carbon monoxide emission data to substantiate a standard, economic information, alternative standards, and enforcement aspects of the proposed standard are also discussed.

48497 **APTIC NO. 69899**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

EPA RESPONSE TO REMAND ORDERED BY U.S. COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA IN PORTLAND CEMENT ASSOCIATION V. RUCKELSHAUS (486 F. 2D 375, JUNE 29, 1973). *Rept. EPA-450/2-74-023, 162p., Nov. 1974. 55 refs.*

NTIS: PB 237952/AS

On June 29, 1973, the U. S. Court of Appeals for the District of Columbia remanded to the Environmental Protection Agency (EPA) the standards of performance for Portland cement plants promulgated under section 111 of the Clean Air Act, directing the Agency to reconsider the standards and to provide additional explanation of the action taken. The EPA reviewed the standards for these plants pursuant to the remand and concluded that standards other than the opacity standard should not be revised. A detailed technical justification and explanation of the actions taken by the Administrator of EPA in promulgating the standards for Portland cement plants is given. Included is the justification for revising the opacity standard. The EPA concluded that the standards are achievable and have been achieved by both wet and dry process kilns, that the economic costs are reasonable, and that the adverse environmental impact is minimal. (Author abstract modified)

48498 **APTIC NO. 69967**

National Academy of Sciences/National Research Council, Washington, D. C., Committee on Motor Vehicle Emissions

REPORT BY THE COMMITTEE ON MOTOR VEHICLE EMISSIONS. *Environmental Protection Agency Contract 68-01--402, 202p., Nov. 1974. 114 refs.*

The feasibility of meeting the emissions standards for light-duty motor vehicles in accordance with the Clean Air Amendments of 1970 was investigated. Most 1975 models will meet the Federal 1975 emissions standard of hydrocarbons/carbon monoxide/nitrogen oxides of 1.5/15/3.1 g/mi with about the same fuel economy as 1970 vehicles. The 1977 Federal emissions standard of 0.41 g/mi hydrocarbons, 3.4 g/mi CO and 2.0 g/mi NOx can be achieved in certification with present technology through improved oxidation catalysts and quick warm-up techniques at an average increased lifetime cost per car over 1970 vehicles of about $400. The Federal 1978 emissions standard of 0.41 g/mi hydrocarbons, 3.4 g/mi CO, and 0.4 g/mi NOx can probably be achieved in Environmental Protection Agency certification procedures on the existing schedule using catalyst technologies. Poor maintenance can prevent cars from meeting NOx standards. Alternative approaches for meeting hydrocarbon, CO, and NOx standards are being developed and include: the prechamber, dual carburetor, stratified-charge engine with a thermal reactor; the lean-burn systems with thermal reactors; the diesel engine; and the direct fuel injection, stratified charge engines with oxiding catalysts. (Author conclusions modified)

1973

48499 **APTIC NO. 69447**

Thuillier, Richard H.

AIR QUALITY STATISTICS IN LAND USE PLANNING APPLICATIONS. *Preprint, 4p., 1973 (?). 7 refs. (Presented at the Conference on Probability and Statistics in Atmospheric Science, 3rd, Boulder, Colo., June 1973.)*

National primary and secondary ambient air quality standards for carbon monoxide, hydrocarbons, nitrogen dioxide, photochemical oxidants, particulate matter, and sulfur dioxide are reviewed in relation to land use planning applications. An approach similar to the application of safety factors to the construction of physical structures is recommended for land use planning which should assure that excesses of defined air quality standards occur infrequently in the area of concern. Maximum allowable annual arithmetic mean pollutant concentrations as a function of standard geometric deviation for various state and primary federal standards and isopleths of standard geometric deviation for a 1-hour averaging time which are based on Larsen s statistical model are presented to facilitate reasonable and standardized estimates of tolerable emission rates consistent with defined air quality standards. The preparation of similar materials relating emission rates to key land use parameters such as population density and vehicle mileage will allow direct estimates of growth limitation requirements in terms of population density and traffic volume.

48500 **APTIC NO. 66327**

Walters, Donald F.

GUIDELINES AND STANDARDS FOR AIR POLLUTION CONTROL. *Limestone, 1973:22, 44-49, Fall 1973. 17 refs.*

Air pollution control regulations and procedures established by the Clean Air Act are outlined. These regulations apply to all sources of particulate matter, sulfur dioxide, carbon monoxide, hydrocarbons, and nitrogen oxides. There are additional standards for hazardous pollutants such as mercury, beryllium, and asbestos. Federal New Source Performance Standards were promulgated for particulate matter, SO2, and Nox from steam generators; particulate matter from incinerators and portland cement plants; NOx from nitric acid plants; and sulfur oxide and acid mist from sulfuric acid plants.

48501 **APTIC NO. 69664**

Committee on Public Works (U. S. Congress), Subcommittee on Air and Water Pollution

DECISION OF THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY REGARDING SUSPENSION OF THE 1975 AUTO EMISSION STANDARDS. PART 1. *93rd Congress (Senate), First Session, Serial 93-H9, 466p., April 16-18, 1973. (Hearings before the Subcommittee on Air and Water Pollution.)*

GPO

A hearing was held for the purpose of permitting the Administrator of the Environmental Protection Agency to present formally his decision regarding suspension of 1975 auto emission standards. The decision requires the use of catalysts on a substantial portion of 1975 vehicles, thereby attempting to minimize initial production problems and their potential impact on the public while requiring each manufacturer to gain production experience preliminary to use of catalysts on all conventional engines during the 1976 model year. Under the decision the Federal and State standards applicable to 1975 cars sold in California will be 0.9 g/mi of hydrocarbons, 910 g/mi of carbon monoxide, and 2.0 g/mi of nitrogen oxides, which will require use of catalytic converters on all 1975 passenger cars shipped to California. Except to the extent that a vehicle is subject to a more stringent CO standard applicable to vehicles shipped to California, all 1975 light duty vehicles, other than multipurpose vehicles, shall be subject to the following Federal interim standards: 1.5 g/mi HC, 15 g/mi CO, and 3.1 g/mi NOx, which can generally not require the use of catalytic reactors. Multipurpose vehicles shall for the most part be subject to emission standards applicable to 1975 light trucks. The economic and other effects of the decision, fuel economy and emission control relationships, the feasibility of various control methods and alternate engines meeting emission standards, and comments by various witnesses are included.

1972

48502 **APTIC NO. 69550**

Bisselle, C. A., S. H. Lubore, and R. P. Pikul

NATIONAL ENVIRONMENTAL INDICES: AIR QUALITY AND OUTDOOR RECREATION. *Mitre Corp., Washington, D. C., Council on Environmental Quality Proj. 1910, MTR-5169, 262p., April 1972. 60 refs.*

Separate indices of air pollution and outdoor recreation were formulated and computed for selected cities in the United States. Guidelines for implementation of an operational data collection and reporting system to allow routine computation of these indices are described. There was a general decline in the percent of cities exceeding standards on a national basis for sulfur dioxide and nitrogen dioxide. The percentage of cities with a total suspended particulates problem increased from 1968 to 1969 and declined only slightly in 1970. The nitrogen dioxide and total suspended particulates problem is far more severe and extensive than the sulfur dioxide problem, based upon present National Ambient Air Quality Secondary Standard values. The northeast region contributes the largest percent to the total value of the National index. The inclusion of photochemical oxidants for western cities or carbon monoxide for major cities would alter this depiction. The effects of contaminants such as fluorides, lead, cadmium, pesticides, and other toxic airborne substances require further studies and monitoring.

1971

48503 **APTIC NO. 69683**

Aleta, C. R.

A CRITIQUE OF THE NEW EPA EMISSION STANDARDS FOR NEW STATIONARY SOURCES. *Cornell*

Univ., Ithaca, N. Y., Cornell Energy Proj., National Science Foundation Research Grant GI-29903X, Rept. 71-11, 17p., Oct. 1971. 16 refs.

NTIS: PB 228 787

The new Environmental Protection Agency emissions standards for new stationary sources were analyzed to determine if they can be met by the power plants. Each pollutant was investigated separately. Much of the equipment available to remove particulate matter is rated as having efficiences greater than 99%. This ensures compliance with the standards when using coal within the ash limits (3% to 20%). No less than 90% efficiency is required when burning the low ash coal. The sulfur content of bituminous coal may range from less than 0.5% to more than 5% based on dry weight. This corresponds to less than 0.385, to more than 3.8 lb S/million Btu. The average S content of coal used for electric power generation is approximately 2.5%; about 90% or more of the S appears in the stack gases as sulfur oxides. The proposed emission standard is 1.2 lb sulfur dioxide/million Btu input. Successful compliance with emission standards depends upon commercial breakthrough of processes under development. A 90% removal efficiency is sufficient to meet the standards when using coal with up to 5% S content and heating values of 10,000 to 15,000 Btu/lb. There is no commercial process designed to remove NOx from flue gases. It is doubtful if any can be met developed within the next 5 yr. High temperature combustion of coal coupled with proper furnace design seem preferable to low temperature combustion (such as in the fluidized bed type) because of possibly lower NOx emissions. (Author abstract modified)

1961

48504 **APTIC NO. 75034**

Ryazanov, V. A.

PRINCIPLES FOR HYGIENE ATMOSPHERIC POLLUTION STANDARDS. *(Printsipy gigienicheskogo normirovaniya atmosfernykh zagryazneniy). In: Rukovodstvo po Kommunalnoy Gigiene. V. A. Ryazanov (ed.), Vol. 1, Moscow, Medgiz, 1961, Chapt. 9, p. 194-206. Translated from Russian, 26p.*

To provide a hygienic evaluation of the degree of atmospheric pollution, a scale must be used to show how much the given concentration exceeds the permissible limit. Such a scale is the maximum permissible concentration of the pollutants in the atmosphere. The principles for determining maximum permissible concentrations are described. Maximum permissible concentrations are listed for some common atmospheric pollutants.

LEGAL AND ADMINISTRATIVE

1975

48505 **APTIC NO. 70247**

Fock, Martin, Karl-Heinz Lies, and Laszlo Pazsitka

CRITICAL CONSIDERATION ON THE EUROPEAN EMISSION HOMOLOGATION - ERRORS AND PROBABILITY ANALYSIS. *(Kritische Betrachtung der Europaeischen Abgastyppruefung Fehler-und Wahrscheinlichkeitsanalyse). Text in German. Motortechnische Zeit. (Motor Engineering Times), 36(1):2-10, 1975. 8 refs.*

The Exhaust Emission Certification Test for Europe is analyzed on the basis of statistical methods. The probability of passing the test is calculated and the engineering goals or safety margins to be maintained by manufacturers are determined. The probability of passing the test is given as a function of mean emission values. The new Certification procedure is an additional aggravation of the limited values. It is therefore proposed that a retest be permitted when the mass emission values of the first measurement exceed the standards.

48506 **APTIC NO. 70120**

Kirk, Alan G., II

MOTOR VEHICLE POLLUTION CONTROL SUSPENSION REQUEST. NOTICE AND PROCEDURES FOR PUBLIC HEARING. *Federal Register, 40(1):21-22, Jan. 2, 1975.*

Notice is given for a public hearing to consider arguments and information relevant to the decisions on applications for suspension of the statutory 1977 hydrocarbon and carbon monoxide emission standards for light duty vehicles. The considerations which the Administrator must make in decisions granting suspensions are described, and the procedures for the public hearings are reviewed.

48507 **APTIC NO. 70103**

Quarles, John

ENVIRONMENTAL PROTECTION AGENCY. STAGE II VAPOR RECOVERY REGULATIONS. DEFERRAL OF CERTAIN INCREMENTAL DATES. *Federal Register, 40(3):1126-1127, Jan. 6, 1975.*

The Jan. 1, 1975 date for submittal of control plans, the March 1, 1975 date for signing contracts, and the May 1, 1975 date for initiation of on-site construction for Stage II (vehicular fueling) vapor recovery systems for 12 air quality control regions are deferred until further notice to allow time for the issuance of a test procedure which will require that systems pass a test designed to reflect their ability to achieve 90% recovery under real world conditions. The deferral will also allow the systems to be tested and will allow doubts existing with respect to a source s current obligations under present regulations to be eliminated.

48508 **APTIC NO. 70118**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. SUSPENSION OF EFFECTIVENESS OF PARKING MANAGEMENT REGULATIONS PENDING PROMULGATION OF AMENDMENTS. *Federal Register, 40(9):2585-2586, Jan. 14, 1975.*

The effectiveness of the parking management regulations to be amended by the Aug. 22, 1974 proposal, including the applicability date, are suspended pending the promulgation of amendments. The amendments will be promulgated within 90 days. The suspension will not affect the final rulemaking procedures presently followed by the Environmental Protection Agency on this subject and will end upon promulgation of the amendments proposed on Aug. 22, 1974. The Aug. 22, 1974 amendments extended parking management regulations to various major urban areas including the areas of Fairbanks, Phoenix, Tucson, Fresno, the San Joaquin Valley, Los Angeles, Sacramento, San Diego, Washington, D. C. and Maryland and Virginia suburbs nearby, Baltimore, Boston, New York suburbs in New Jersey, New Jersey suburbs of Philadelphia, Philadelphia, Pittsburgh, Houston, and Virginia.

48509 **APTIC NO. 70081**

Wallen, Carl C.

GLOBAL ATMOSPHERIC MONITORING. *Environ. Sci. Technol., 9(1):30-34, Jan. 1975. 2 refs.*

The World Weather Watch (WWW) program of the World Meteorological Organization is described which consists of a global observing system, a global telecommunication system, and a global data- processing system to monitor the atmosphere and determine changes in the atmosphere and in meteorology. In addition to the multipurpose basic WWW monitoring system, the World Meteorological Organization also conducts and coordinates a series of specialized single-purpose systems which support research activities in atmospheric science, studies and applications of environmental problems, and special applications of meteorology. Changes in the chemical composition of the atmosphere, background pollution, and high concentrations of air pollution are monitored. Regional and baseline air pollution stations operate to monitor changes in atmospheric composition. The United Nations Environmental Program has supported efforts of WWW to monitor global pollution.

1974

48510
APTIC NO. 69219

Aiba, Hiroharu

AIR POLLUTION SOURCE-MONITORING SYSTEM UNDER AIR QUALITY STANDARD. *(Soryo kisei ni motozuku taiki osen hassegen kanshi shisutemu). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(11):74-77, Nov. 1974. 1 ref.*

The on-line air pollution monitoring system for Chiba prefecture is outlined. The system involves 21 monitoring stations at large companies from which information is relayed to a central control system which then returns the necessary measures to regulate the levels of sulfur oxides, nitrogen oxides, and other oxidants levels in the area. The pollution level of each location is reported every 15 min, and by taking the average of the information for 1 hr, the over-all pollution level in the area is then calculated. Based on the calculation, the central control center relays the permissible level of pollutants to each company. Each company must then regulate its factory operation time or substitute a fuel containing less sulfur. About 80 more monitoring stations are planned for future installation.

48511
APTIC NO. 70154

Alexander, Robert C.

CALIFORNIA S MANDATORY VEHICLE EMISSION TESTING PROGRAM. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 135-151. (Sept. 25-27.)*

California s mandatory vehicle emission testing program resulting from a law passed by the 1973 state legislation is reviewed. The program is to be implemented in three phases: a trial inspection program limited to the city of Riverside and becoming operational in early 1975, an inspection program for approximately one million vehicles which transfer ownership within the six county South Coast Basin (fully operational by December 31, 1975), and inspection of every vehicle upon initial registration and upon each annual renewal of registration (operational by December 31, 1976). The Air Resources Board of California is proposing new exhaust emission standards to serve as the basis for the testing program. Standards are to be set for idle, low cruise, and high cruise modes, with variations depending on vehicle age. Inspection and diagnostic procedures are to involve dynamometer emissions tests for hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen (engine under load) along with simultaneous engine analysis. After any indicated adjustments or repairs are performed at the owner s garage of his choice, a follow-up test is performed. If the vehicle is determined to be in need of further maintenance and repairs determined to cost more than $150 or 20% of the low market value of the vehicle (whichever is lower), a certificate of waiver is issued which also authorizes the vehicle owner to acquire his annual vehicle registration. A program for the initial certification of inspection facilities is also being developed.

48512
APTIC NO. 65167

Baum, F. and H. Schwegler

CONSIDERATIONS CONCERNING THE FEASIBILITY OF EMISSION MEASUREMENTS IN CONNECTION WITH THE LEGALLY REQUIRED CHECKS. *(Ueberlegungen zur Durchfuehrbarkeit von Emissionsmessungen im Rahmen gesetzlich angeordneter Ueberpruefungen). Text in German. Gesundh.-Ing., 95(8):220-222, 1974. 14 refs.*

According to the Federal Immission Protection Act the erection and operation of plants which are prone to lead to environmental pollution of any sort require an operating license. In granting an operating license emission and immission measurements are taken once the new plant has gone into operation or after completion of major modifications. For Bavaria two official measuring stations have been assigned to carry out this task. Since the required emission and immission measurements have to be repeated every five years, there is not nearly enough personnel and equipment to fulfill this requirement adequately. It is recommended that public institutions which are concerned with environmental protection, (e.g., the Landesanstalt fuer Immissions-und Bodennutzungsschutz of North Rhine Westphalia (Land Establishment for Air and Land Conservation)) work out simple methods which the district chimney sweeps can then use for sampling at the individual sources. The analyses and evaluation of the data can then be performed at the state institution.

48513
APTIC NO. 65218

Berry, Michael A.

PLANNING THE MAINTENANCE OF AIR QUALITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-71.)*

Background information for the 10-year air quality maintenance plan is presented using the modified rollback model as a vehicle for discussing analysis methods used in the development of air pollution control strategies. A number of basic concepts for air quality management such as growth analysis, emission reduction factors, sampling techniques that might replace emission inventories, and isolation of emissions by source type are discussed and developed into a process that more objectively analyzes maintenance qualities of control strategies. Also shown is how various types of air quality-related data can be organized and used as decision variables. The consideration of growth and emission variables is essential for selecting control strategies that are in line with the social and economic goals of communities. A soft approach to mathematical analysis is taken throughout the paper. A framework is shown allowing a planner to isolate sources of emissions while at the same time relating growth and emission reduction and other factors to individual source categories. An algorithm is recommended that allows an air quality manager to take quantitative steps that will lead to sound air quality maintenance strategies.

48514
APTIC NO. 67048

Brasser, L. J.

QUESTIONS RELATED TO THE SELECTION OF AIR POLLUTION MEASURING SYSTEMS. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 6, p. 135-153. 6 refs.*

Before installing an air pollution measurement system, the objectives of the measurements must be considered. The most frequent reasons for the system are inventorization, determination of air pollution trends, study of effects of pollution on human health, study of effects of pollution on vegetation, animals, or materials, alarm purposes, and research. Because of the different objectives, there are different levels of networks, ranging from very simple to very sophisticated systems. These types of systems include preliminary studies, air quality measurements, automatic air quality monitoring, sampling with a mobile apparatus, measurements of traffic pollution, studies around pollution sources, and stack sampling. The density of the network and frequency of sampling vary depending on the level of the network. Different levels of automation also occur. Costs and cost-benefit analysis of air pollution measurements, types of instruments, and data handling are also important aspects of developing an air pollution measuring system.

48515 **APTIC NO. 70163**

Capelle, Donald G.

PREFERENTIAL BUS OPERATIONS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 325-338. (Sept. 25-27.)*

Various projects through the United States involving the employment of preferential bus operations to improve urban and suburban air pollution problems are reviewed. The techniques for providing preferential treatment for high occupancy vehicles include: exclusive freeway lanes for buses (and carpools) in the normal direction of flow and contra-flow, priority bus lanes, priority access to freeways, and complenetary facilities such as fringe parking, terminals, and passenger shelter. Preliminary operational results from the various projects reviewed indicate substantial changes achieved in the volume and composition of traffic and the speed of vehicle operation. One demonstration program has demonstrated that the annual peak-period automobile- generated pollutants not released into the atmosphere due to preferential mass transit operations is 1730 tons.

48516 **APTIC NO. 70287**

Ciotto, A.

LEGAL FOUNDATIONS CONCERNING CONSERVATION OF CLEAN AIR WITH REGARD TO OIL-FIRED HEATING SYSTEMS. *(Gesetzliche Grundlagen zur Reinhaltung der Luft in bezug auf die Oelfeuerungsanlagen). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 25-30. (June)*

On February 7, 1972 the Swiss Department of the Interior (Eidgenoessisches Department des Innern) issued guidelines concerning limitation of emissions from domestic heaters and industrial firing systems. Based on these guidelines the Kanton Zurich issued on April 12, 1972 regulations concerning the waste gases from firing systems. The regulations pertain to all firing systems operated with solid, liquid, or gaseous fuels for the purpose of producing heat, steam, hot water, or electricity regardless of the size. The oil-fired domestic and industrial firing systems have been divided into three classes, class A-I for systems consuming up to 200 kg oil/hr, class A-II for systems consuming between 201 and 1000 kg oil/hr and class A-III for systems consuming more than 1000 kg oil/hr. All domestic heaters fall into class A-I and can be controlled by the method by Bacharach. This class may burn only extra light fuel oil with a sulfur content of not more than 0.5% by weight, and beginning Jan. 1, 1974, 0.3%. The owners of firing systems have to perform visual checks regularly and every two years an expert named by the municipality will inspect the firing systems.

48517 **APTIC NO. 70160**

DeKany, John P.

STATUS REPORT. RETROFIT EVALUATION PROGRAM. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 273-280. (Sept. 25-27.)*

Comments concerning the Environmental Protection Agency's test procedure and protocol development for exhaust emission retrofit devices published in the March 27, 1974 Federal Register are reviewed. The basic objectives of the Retrofit Protocol Development Program are: provision of a standardized and centralized evaluation program to compile technical data on various exhaust emission retrofit devices; the dissemination of this information to state and local authorities responsible for implementation of transportation controls; and evaluation of the emission control potential, durability, driveability, and fuel consumption effects of specific retrofit devices. Principal comments received from the public concerning the program include objections to the total program cost and restrictions placed on the use of previously acquired data, suggestions for geographic and climatic considerations, objection to the application of retrofit protocol to medium duty vehicles (currently regulated under Federal heavy duty engine regulations), and suggestions for enforcement and/or surveillance mechanisms to be incorporated into the protocols. Analysis of the comments is complete, and the protocols will be republished to reflect the conclusions of the analysis of comments.

48518 **APTIC NO. 65221**

Ellis, G. W., W. T. Camps, R. T. McNider, and B. J. Schroer

BRIDGING THE GAP--AIR QUALITY MODEL DEVELOPMENT TO AIR QUALITY MODEL USE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1974. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-74.)*

Mesoscale and microscale air quality models that are in use in Alabama for transportation planning and environmental impact analysis are described, including the Stanford Research Institute APRAC-1A, EPA, and California line source models, and emission inventory and pollutant burden models developed by the state of Alabama. The techniques and procedures used to apply and combine the results of these models on an efficient operational basis are described. Special attention is given to problems that were encountered in using the models, such as specification of worst-case meteorological conditions for planning purposes, determining traffic distribution, and validation of the models. A pollutant burden model is described that allows the results of the complex emission and mesoscale models to be interpolated for intermediate years between the base year and the system forecast year. Graphical displays of air quality studies in six urbanized areas in Alabama are used as examples of the methods employed. For mesoscale modeling, wind direction and receptor locations are critical in determining concentration levels. A special procedure was devised using the APRAC-1A to maximize concentrations by wind direction so that true maximum potential concentrations for the entire area under consideration can be established. A tabular summary of traffic emissions and maximum concentrations is provided for the six urbanized areas of Alabama, together with related traffic conditions.

48519 **APTIC NO. 70121**

Form, R. W.

WEST VIRGINIA IMPLEMENTATION PLAN. MISCELLANEOUS AMENDMENTS. *Federal Register, 39(248):44161-44162, Dec. 24, 1974.*

The public is advised of the receipt of proposed amendments to the West Virginia State Implementation Plan, and public comment is solicited. The proposed changes include: an amendment to Regulation II, To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers; amendments to Regulation VII, To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations; amendments to Regulation XIII, Permits for Construction, Modification, or Relocation of Stationary Sources of Air Pollutants, and Procedures for Registration and Evaluation; and amendments to the implementation plan's control strategies for particulate matter.

48520 **APTIC NO. 67045**

Friedman, Morton H.

INFORMATION RETRIEVAL CAPABILITIES AT THE NATIONAL ENVIRONMENTAL RESEARCH CENTER, EPA, CINCINNATI. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 3, p. 35-65.*

Four National Environmental Research Centers of the Environmental Protection Agency have been established to conduct on-going studies on the health and ecological effects of environmental contaminants and on pollution control. The EPA Library System has 26 libraries, and the NERC/Cincinnati library was designated as the Central Technical Library for the agency. The library has access to a number of information centers containing over 35 scientific and technical computerized data bases. Literature searches are conducted using a variety of terminals, and no-line and off-line data base services. On-line searches involve querying the data bases and providing immediate response between the user and the data base through the computer terminal in the library. The MEDLINE is one example of an on-line retrieval system; the LEADER system at Lehigh University is another example. Current awareness and retrospective searching is also available at the NERC/Cincinnati facility. Several data bases are described including the Bibliography of North American Geology, Biological Abstracts-Previews, CA-Condensates, Cataloging and Indexing, Chemical-Biological Activities, Chemical Titles, Computerized Engineering Index (COMPENDEX), Current Information Tapes for Engineers, Educational Resources Information Center, Environmental Protection Agency Funded Data Bases (Analytical Methodology Information Center, Environmental Information Retrieval On-line, EPA Library Files, and Solid Waste Information Retrieval System), Geological Reference File, Geophysical Abstracts, Institute for Scientific Information Science Citation Index, Machine Readable Catalog, MEDLINE, National Technical Information Service, Nuclear Science Abstracts, PANDEX--Current Index to Scientific and Technical Literature, Psychological Abstracts, Searchable Physics Information Notices, Sociological Abstracts, TOXLINE, and TOXITAPES. The Georgia Information Dissemination Center is described in an appendix.

48521 **APTIC NO. 70155**

Garcia, Gaspar

AUTOMOTIVE AIR POLLUTION IN MEXICO. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 153-165. (Sept. 25-27.)*

Efforts to control automotive air pollution in Mexico are reviewed. Federal law, beginning in 1971, requires that all new motor vehicles sold in Mexico be equipped with crankcase emission control devices. The 1975 Mexican emission standards applicable to light duty vehicles prescribe 4.1 g/mi for hydrocarbons and 47 g/mi for carbon monoxide. Thye Agency for Environmental Improvement, established on January 14, 1972, guarantees the correct application of laws and regulations regarding pollutants of all types and from all sources. Mexico City authorities are planning to establish an inspection program which will include five inspection-maintenance stations located in strategic points about the city. A prototype vehicular inspection station will operate on a pilot basis and will consist of three inspection lanes for idle and higher revolutions/min testing and a fourth lane for chassis dynamometer tests under load. An extensive public information campaign is to be presented, stressing health hazards of vehicular emissions and cooperation among car repairmen, service station attendants, and drivers. Installation of retrofit devices is considered only as a future approach. Actions are also being undertaken to improve the mass transportation system. Starting October 1, 1974 unleaded gasoline complying with American standards will be available.

48522 **APTIC NO. 70156**

Gillaspy, Roy E.

MOTOR VEHICLE EMISSIONS CONTROL TRAINING PROGRAM. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 167-177. (Sept. 25-27.)*

A 1-year project to develop a complete and comprehensive training program for servicing emission control devices on motor vehicles is described. Instructional materials and packets of information are being developed by vocational automotive instructors from 24 states. These teachers are to be the intiial national thrust for the implementation of motor vehicle emissions control programs in states attempting to meet state and Federal emissions standards. The program package is to be available for automotive teachers at all levels of education across the country, with the ultimate objective being a corps of mechanics who can maintain automobiles within Federal and state emissions standards and who can assist in advancing the state of the art in air pollution control. (Author abstract modified)

48523 **APTIC NO. 65211**

Gise, James P.

APPLICATION OF PROGRAMMABLE CALCULATOR SYSTEMS IN AIR QUALITY DATA REPORTING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-61.)*

The programmer calculator system utilized by the Texas Air Control Board is obtained to minimuze the time between actual monitoring of the ambient air quality during special studies and the publication of reports summarizing and analyzing the data and to bridge the gap between a manual and computerized system of data reduction and reporting. The calculator system exceeded expectations and justified its cost many times over. With a total outlay of approximately $10,000 for the system plus the salary of one operator/programmer, there is the capability, in one week s time, of summarizing, analyzing, and correlating three months of hourly continuous data for ten parameters in finished report form. Evaluation and reporting of air pollution data during an Air Stagnation Advisory has been simplified, so that one operator can receive and process input from twelve fully instrumented continuous monitoring stations daily. The writing, testing, and functioning of most programs for special projects can be accomplished in two days or less. The amount of time it takes to produce frequency histograms, wind or pollution roses, correlation studies, or standard statistical analyses is determined primarily by the amount of data involved. (Author abstract modified)

48524 **APTIC NO. 69942**

Goodrich, John C., Scott T. McCandless, Michael J. Keefe, William P. Walsh, and Alan H. Epstein

AIR QUALITY FOR URBAN AND INDUSTRIAL PLANNING. *Environmental Research and Technology, Inc., Lexington, Mass., Office of Air and Waste Management Contract 68-02-0567, ERT Document P-434, Rept. EPA-450/3-74-020-a, 100p., March 1974. 22 refs.*

NTIS: PB 238559/AS

Studies designed to develop a system for the evaluation of air pollution impact in relation to urban and industrial planning are reported. The studies are divided into three tasks: the development of improved emissions projection activity indices, the development of a methodology for incorporating cost data into the evaluation of the air pollution impact of land use plans, and the performance of land use-air pollution impact sensitivity studies. Subtasks of the above studies include: defining principal land use categories and specifications for statistical validity, collecting 1970 implementation plan point and area source inventories, compiling and processing available data using standard tabulation and statistical computer programs, analyzing data and deriving activity indices for current emissions estimation, developing methodology for the projection of activity indices for future emissions estimation, documenting the data, methodology, and derived activity indices, incorporating the resulting activity indices into an Air Quality for Urban and Industrial Planning (AQUIP) system, surveying the literature and Federal contract research efforts to compile source air pollution control cost data and data on costs and economic impacts of implementation plan control strategies, developing a methodology for including cost data in the evaluation of land use plans, compiling representative cost data to test and demonstrate techniques for hypothetical application, documenting demonstration results, making recommendations for incorporation of cost data into the AQUIP system, identifying case studies, land use configuration alternatives, and facility design choices for inclusion into sensitivity analyses, preparing AQUIP inputs and processing resulting air quality as a function of sensitivity analysis parameters, and documenting the results in the form of guidelines for planners.

48525 **APTIC NO. 70286**

Hess, W.

THE NEW SWISS GUIDELINES CONCERNING BURNER - BOILER - CONSTRUCTION. *(Die neuen eidgenoessischen Richtlinien bezueglich Brenner - Kessel - Konstruktion). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf. Basel, Switzerland, 1974, p. 19-24. 3 refs. (June.)*

Based on a large number of experiments conducted by Swiss manufacturers of oil burners, minimum requirements concerning combustion chamber geometry were set up. Also, Swiss experts have agreed that the combustion chamber load cannot be optionally increased. With regard to the operating time of the burner, it has been found that even in summer the operating time should be several minutes. Too little attention has been paid in the past to the insulation of boilers. Good insulation is important for fuel consumption and thus also for the amount of combustion waste gases. Thus, regulations concerning the radiation loss for boilers were also passed in Switzerland. Practical experience has shown that boilers with less than 20,000 kcal/hr do not operate well and are extremely prone to difficulties. As a consequence they also cause waste gas problems. All these experiences were used in the drafting of the new guidelines which are the first to attempt to combine burners and boilers harmoniously.

48526 **APTIC NO. 65205**

Hougland, Erik S. and N. Thomas Stephens

AIR POLLUTANT MONITOR SITING BY ANALYTICAL TECHNIQUES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1974. 3 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-49.)*

A source oriented monitor site location model providing monitor site assignments designed to maximize monitor coverage of a region within existing equipment limitations is presented. It gives priority to areas with high emission levels and high concentrations without neglecting weaker sources. The method is easy to use and inexpensive in computer resources. It is limmited by the necessity to use a discrete set of potential sites. A model which can choose from the continuous set of points of a map is required. The sensitivity of the model to input parameters such as the number of wind directions and the spacing of potential monitor sites needs to be examined in detail. Refinements in the calculation of coverage factors needs to be made. Work on these items is currently in progress. Results of an example problem are presented and compared with a monitoring network already in place. (Author summary modified)

48527 **APTIC NO. 75040**

Jefferies, J. G.

POSSIBLE PROVINCIAL STRATEGIES FOR CONTROLLING AUTOMOBILE EMISSIONS. *Preprint, American Public Works Assoc., 15p., 1974. (Presented at the American Public Works Association, International Public Works Congress, Toronto, Ontario, Sept. 14-19, 1974.)*

The province of Ontario has passed legislation to control air pollution from motor vehicles. Federal standards which were identical to those of the province were established. A number of control strategies to meet these standards are being considered. One method would require all vehicles to undergo an exhaust emission check prior to annual registration. Proposed standards were derived from an on-going inspection vehicle. In general, standards of this type would reject the worst 10% of the vehicles being tested; but initially the rejection rate could be as high as 25-30%, so it may be necessary to have more lenient standards during the first year and then enforce the full standards. New cars might be forced to be tested under warranty to ensure that they comply with the standards. The standards would be slightly more stringent under warranty to permit some deterioration in control performance later in the vehicle's life. When these intermediate strategies have been brought into effect, it will then be possible to determine the necessity to introduce legislation to require all automobiles in the province to undergo a regular, probably annual, emission check. Regular emission testing will probably be required for automobiles having catalytic systems. When inspections are analyzed in terms of costs and benefits, it seems that an annual emission inspection would not be justified only on a province-wide basis. Alternatives could be undertaken, such as introducing the standards only in the southern part of the province which contains greater vehicle pollution. There should be some provincial inspection strategy to back-up the Federal legislation.

48528 **APTIC NO. 67050**

Juda, Jan

DESIGN OF AIR QUALITY MONITORING NETWORKS. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 18, p. 347-356. 9 refs.*

The problem of the design of emission sampling networks and sampling plans is discussed. Planning of the sampling program is closely related to the amount of necessary information and the manner of its utilization. Pollution samples should provide quick and thorough information about pollution that presents a threat to the public health and well-being. Air pollution sampling plans should have the objective of obtaining maximum information for a given number of individual samples. The fulfillment of this condition is especially difficult because of the strong variability of air pollution concentrations over time and space. Nevertheless, some general initial assumptions may be derived directly from information theory. The proper planning of a sampling network is impossible without carrying out a period of information sampling first. The location and number of samples necessary must be determined. Emergency sampling networks have been implemented in a number of big systems. Organization and planning of measurements from a general air quality surveillance network principally should be the same as for information sampling networks.

48529 **APTIC NO. 70150**

Kirkpatrick, Lane W.

STATE POLLUTION CONTROL AGENCIES VIEWPOINT ON MOTOR VEHICLE EMISSION CONTROL STATEGIES. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 35-75. (Sept. 25-27.)*

Questionnaire replies concerning motor vehicle emission control strategies of 10 key states with motor vehicle related air pollution problems are summarized. Major problems encountered by states in developing mandatory inspection programs include lack of public acceptance, difficulty in adequately training the repair industry, problems of tampering and achieving enforcement, debates over the relative merits of idle versus key mode testing and state versus private assessment of emission control degradation, and various political and financial hurdles. Delays in implementing retrofit strategies exist because of unexpected degradation after installation, manufacturer reluctance to assist states without strong state enabling authority to install retrofits, and failure of the Environmental Protection Agency to complete its document on uniform certification guidelines. The reaction to and success of different public transit improvements and single passenger vehicle use reduction strategies are mixed. Scattered state success is seen in bikeway planning and use, improved signalization, traffic by-pass techniques, car free zones, metered freeways, and work schedule changes. Negative type single passenger use disincentives are not being pursued by states.

48530 **APTIC NO. 65524**

Kornreich, Lawrence D.

CONSORTIA ACTIVITIES IN SUPPORT OF INDUSTRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-166.)*

Programs that the six University Consortia have sponsored in support of industry as well as possible programs that may provide future opportunities for interaction between the Consortia and the industrial communities are described. The programs include: short courses, special publications, seminars, and conferences in the areas of metallurgical processes, the Clean Air Act, the nitrogen oxides problem, air pollution control strategies, state implementation plans, environmental quality standards, and legal aspects of air pollution. Many programs sponsored by the Consortia which have benefited universities and control agencies can be adapted to support industry. These include internships, continuing education, part-time degrees, and joint research. (Author abstract modified)

48531 **APTIC NO. 69355**

Lachapelle, David G., Joshua S. Bowen, and Richard D. Stern

OVERVIEW OF ENVIRONMENTAL PROTECTION AGENCY S NOX CONTROL TECHNOLOGY FOR STATIONARY COMBUSTION SOURCES. *Preprint, American Inst. of Chemical Engineers, New York, 87p., 1974. 31 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Dec. 4, 1974.)*

An overview of the Environmental Protection Agency s nitrogen oxides control technology program for stationary sources is presented. Topics discussed include: national ambient air quality standards, new source performance standards, state and local standards, sources and levels of NOx emissions, mechanisms of nitric oxide formation, combustion control and modification techniques, flue gas cleaning technologies (scrubbing, molecular sieve absorption, and catalytic reduction), and implementation costs. Major stationary sources of NOx considered include: utility and industrial boilers, stationary internal combustion and gas turbine engines, and nitric acid plants. Nitrogen oxide control goals for 1980 are based on extension of existing technology coupled with new burner designs, while 1985 goals possibly entail the redesign of some equipment types or require the use of novel combustion and/or effluent treatment schemes.

48532 **APTIC NO. 65196**

Manson, Alex N., Ben Sokalski, and Henk W. DeKoning

COMPUTERIZED AIR QUALITY MONITORING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-28.)*

The applicability of a computer controlled real-time data acquisition system using automatic instrument calibration for air quality monitoring is presented. The Environment Canada facility is a real-time system controlled by a centrally located mini- computer capable of handling 10 remote sensor stations each producing data on up to 16 parameters. Instrument outputs are actively integrated to overcome the problems of frequent sampling. Two-point dynamic calibration of air monitors is accomplished by calibration controlled under computer initiation. Calibration data is used to detect sensor malfunctions and to update instrument response-concentration equivalent equations automatically. The mini-computer gathers data from the air quality monitors, computer hourly averages 24-hour moving averages for each pollutant, computer 8-hour carbon monoxide averages, and 3-hour hydrocarbon averages and flags values exceeding air quality objectives. All reports are output to hard copy and magnetic tape. All data of questionable validity is manually verified. Invalid data is removed from the magnetic tape by a data editor. The application software is modular and flexible. Any pollutant may be measured over a sample interval independent of those of other pollutants. Air monitors can be calibrated at a selected time during the day automatically or under operator control from the console. All instrument operating characteristics including calibration gas concentrations can be edited through the console. All of these changes can be accomplished without recompiling any programs. The modular design allows the system to be expanded in terms of measuring capability and geography with only minor modifications to existing hardware and software. The data acquisition provides real-time monitoring of air quality for effective episode prediction and emergency measures development; collects data for long-term trend analyses to study the effects of abatement programs; and produces real-time data to be used in conjunction with meteorological parameters for model development and verification. (Author abstract modified)

48533 **APTIC NO. 70153**

McMinn, R. W.

NEW JERSEY S EXPERIENCE WITH AUTOMOTIVE EMISSION TESTING. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 123-134. (Sept. 25-27.)*

The New Jersey automotive inspection and maintenance emission control program is reviewed in terms of its development and operation (since July 1972) and preliminary assessments of its impact. Idle testing, which takes approximately 30 sec when combined with an existing safety inspection, appears to be a practical approach to improving vehicle maintenance practices and reducing emission levels. Such testing is an essential baseline operation if any retrofit programs are anticipated and is probably necessary to retain the benefits of the Federal new car emission reduction program. The capacity and capability of the inspection system and service industry appear to be stretched to their maximum at a 10% rejection rate. Replies from rejected motorists during an advisory period of the program indicate excessive carbon monoxide emissions as the cause of failure in 68.6% of the respondants, hydrocarbon emissions in 34.1%, and visible smoke in 5.95%, with 7.6 not reporting Report costs ranged from $0-10 in 31.8% of the cases to over $100 in 4.7% of the cases.

48534 **APTIC NO. 70165**

Miesse, C. C. and Brian McLean

THY IMPACT OF THE ENERGY CRISIS ON VEHICULAR POLLUTION. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 351-379. 18 refs. (Sept. 25-27.)*

The impact of the energy crisis on emission control requirements promulgated by various transportation control plans is analyzed in terms of variations in pollutant emissions resulting from changing patterns in driving habits, new car purchases, and automobile maintenance. Emission reductions resulting from reduced driving will lead to reduced requirements for emission control devices to attain national ambient air quality standards, while increased emissions resulting from a vehicle population which includes a higher percentage of older cars will necessitate increased reliance on emission control devices. Analysis of the unique characteristics of Baltimore, Philadelphia, Pittsburgh, and Washington, D. C. indicates that for an assumed 10% gasoline shortfall which begins in September 1974, the change in car- buying patterns will result in 6.58%

and 4.82% net decreases in vehicular emissions for Philadelphia and Pittsburgh, respectively, and 2.82% and 8.47% net increases in vehicular emissions for Baltimore and Washington, D. C., respectively. Emissions in Philadelphia and Pittsburgh will not exceed the assumed uniform gasoline shortfall of 10% within the designated time frame, whereas net increases will occur in Baltimore and Washington if the assumed uniform 10% shortfall begins prior to Feb. 1975 or Oct. 1975, respectively. Hence, any Federally- imposed program of gasoline rationing which is designed to reduce vehicular emissions may be counter-productive, depending on the car-mix and time-frame.

48535 **APTIC NO. 65836**

Mitsuida, Shoji

SURVEY OF THE KANAGAWA PREFECTURE ENVIRONMENTAL CENTER. *(Kanagawa-ken Kogai Senta kengakuki). Text in Japanese. Hinshitsu Kanri (Stat. Qual. Control), 25(7):60-66, July 1974.*

The Kanagawa Prefecture Environmental Center was separated from the Prefectural Department of Pollution with 22 staff members in April 1968. The main policy of the center seems to be moderation rather than unrealistic enforcement of strict regulations. A compromise of realistic living standards of citizens and the protection of the environment is attempted. Where pollution is heavy, emission control and improvements are enforced, but another main effort is slowing down of environmental destruction to the minimum possible speed. The center comes under the jurisdiction of the Prefectural Bureau of Pollution Countermeasures and 70% of its operation is administrative, and 30% investigation and research. The center's headquarters and its two branches now hold 82 staff members. The administrative business includes establishment of emission standards and pollution monitoring systems and conducting pollution patrols. The patrol program holds 14 teams of three personnel, and more than 14 weekly patrol tours. At least three factories are inspected on one patrol tour, and about 1974 factories are inspected in a year. A patrol team visits factories without forewarning and inspects buildings and facilities, management of emission sources, and samples emission material. Analyses may be conducted on site or back at the center.

48536 **APTIC NO. 67851**

Munro, Robert D.

ACTIVITIES AND PLANS OF THE ECONOMIC COMMISSION FOR EUROPE IN THE FIELD OF ENVIRONMENT, WITH PARTICULAR EMPHASIS ON ENVIRONMENTAL INFORMATION SYSTEMS. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 21, p. 393-403.*

The work of the Economic Commission for Europe (ECE) is reviewed, with emphasis on environmental information systems. Most of the international cooperation has involved government-to-government sharing of information. The first comprehensive international effort occurred during a Symposium in Czechoslovakia in 1971 with 300 participants from ECE and other countries. As a result of discussions among governments in the preparatory meetings for the Prague Symposium, environmental improvement was established by the Commission in 1969 as one of the four major priorities for the work of all committees at ECE. The major activities and responsibilities relating to environmental problems of various ECE committees and groups are reviewed. The Senior Advisers on Environmental Problems are developing papers and programs on environmental protection subjects. The exchange of information on the environment on an international scale is one of the goals of the ECE.

48537 **APTIC NO. 70147**

Nelson, Roland and George Wehmann

A COMPUTERIZED INDUSTRIAL WASTE MANAGEMENT INFORMATION SYSTEM. *Atomic Energy Commission, Div. of Operational Safety, Proc. A.E.C. Environ. Prot. Conf., 2nd, Albuquerque, N. Mex., 1974, p. 549-567. (April 16-19.)*

NTIS: WASH-1332(74) Volume 1; GPO

In recent years, the reporting and documenting of information on the levels of industrial wastes (nonradioactive) discharged from Atomic Energy Commission facilities have become more important. A computerized Industrial Waste Management Information System (IWMIS) was developed at the National Reactor Testing Station (NRTS) and has been in use since Jan. 1974. The system provides for timely and accurate reports on the amount of all types of industrial waste which has been stored and disposed at the NRTS. The system also provides information on fuel oil usage and water usage and disposal. The IWMIS provides monthly and year-to-date reports. The system is designed to standardize the reporting of all forms and types of waste disposed or stored at the NRTS. The data is input on a monthly basis on a specially designed form by all NRTS contractors. Computerization of the data provides considerable flexibility in making various data readily available from a single data base. The system will be an effective management tool in the management of industrial waste at the NRTS. (Author abstract)

48538 **APTIC NO. 69249**

Nishimura, Yoshiro

POLLUTION MANAGEMENT AND ADMINISTRATIVE GUIDANCE - THE CASE OF OSAKA. *(Kogai gyosei to gyosei shido). Text in Japanese. Toshi Mondai (J. Tokyo Inst. Munic. Res.), 65(7):27-42, July 1974.*

The budget for fighting pollution was increased approximately $6 million, or about 3.7% from 1973 to 1974. The increase for air pollution was about $4 million, or about 20%. The most polluted regions were the western Osaka industrial area and Sakai-Izumi industrial area, where 80% of the total fuel was consumed. Countermeasures against air pollution planned by the Prefectural Government for 1974 included research on photochemical smog formation, promotion of a clean air plan, promotion of automotive exhaust prevention, and expansion of photochemical smog monitoring stations. A blue-sky plan was enforced in 1971, aiming at reducing pollution from some 900 plants in the Prefecture. The subject of the first plan was 100 large plants, each consuming more than 10 k/day of fuel. The subject of the second plan was the heating systems of buildings and facilities in Osaka, while that of the third plan was small plants consuming more than 2 kl/day of fuel. The average sulfur dioxide concentration was reduced to below the goal of 0.05 ppm in 1972. From May 1974, the Prefectural Government also moved to negotiate agreement with large pollution contributors such as power plants. The agreement includes fines and plant shutdown when regulations are seriously violated.

48539 **APTIC NO. 65188**

Ozolins, Guntis, Wayne R. Ott, and Thomas W. Stanley

A NATIONAL PROGRAM FOR QULAITY ASSURANCE IN ENVIRONMENTAL MONITORING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-15.)*

The Environmental Protection Agency is establishing a nationwide program for providing quality assurance in the collection of environmental data. This program consists of the selection and evaluation of appropriate methods for measuring specific pollutants covered by existing regulations; preparation and dissemination of a series of monitoring guideline documents and publications; a national system for the distribution of calibration and testing materials; a program for evaluating the performance of environmental monitoring laboratories; and technical assistance to state and local pollution control agencies. A major part of the quality assurance program in support of ambient air and source standards involves the selection and collaborative testing of measurement methods. Intrinsic in the methods selection process is the concept that other equivalent methods of measurement may be used. To assure that adequate quality control is maintained routinely in every laboratory, an external evaluation system also is being implemented. It combines inter-laboratory tests, on-site inspections, and a periodic review of data. The goal of the quality assurance program is to cover, in a balanced fashion, all laboratories that carry out environmental monitoring, ultimately increasing the validity of data on environmental pollution. (Author abstract)

48540 **APTIC NO. 67044**

Palmlund, Ingar

DESIGN OF A NATIONAL COMPUTERIZED ENVIRONMENTAL INFORMATION SYSTEM. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 2, p. 19-33. 1 ref.*

The design of a national computerized environmental information system in Sweden is discussed. The system will contain information regarding both the external environment and the control and handling of hazardous substances. A model is presented for analysis, planning, and design of environmental data systems. Results of the Swedish preparatory study of the possibility of creating a national computerized environmental information system are discussed. The design of the proposed system and a plan for further development are reviewed. The benefits of a national integrated computerized environmental data system and computerized information processing to support control of pollution in Sweden are also discussed.

48541 **APTIC NO. 69514**

Pearson, Norman

LAND-USE PLANNING FOR AGRICULTURE AND ENVIRONMENTAL MANAGEMENT: PLANNING FOR CLEAN AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974. 20 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th Denver, Colo., June 9-13, 1974, Paper 74-248.)*

The integration of air quality planning with land use planning for agriculture and environmental management is discussed. Three basic regional strategies are vital for effective air quality management for agriculture: Treating or reducing the generated pollutants before or after they enter the environment; regulating the location of the causal activity, or recipients, or both; and modifying or eliminating the causal activity. Planning for clean air is a comprehensive regional planning problem, closely connected with strategic land use planning and guidance of the location of the main elements in the landscape. Land use planning cannot be separated from transportation planning, and both are in need of greater clarity and precision in defining policies for urbanization, industrialization, and agriculture. In this context, we must begin to plan for environmental management using the same regional context and techniques as in river basin planning which already exist. One of the barriers is to establish the jurisdictional, institutional, administrative, and financial context for implementation. Some of the techniques are: land banking of key agricultural lands; steering urban and industrial growth into patterns in conformity with guidelines set out after comprehensive environmental assessments; setting up funds to buy out conflicting pollution sources; closed loop systems of urbanization and total energy systems; and recognition of the complexity of the regional agricultural system. Land use policies for planning in agricultural areas must develop more sophisticated techniques and stronger measures of implementation. Much work must be done in research, technical planning, and in the areas of implementation and enforcement. Incentive systems must also be set up. (Author abstract modified)

48542 **APTIC NO. 69608**

Peirce, A. R. and W. A. Quebedaux, Jr.

DOCUMENTATION OF ADMISSIBLE EVIDENCE FOR ENVIRONMENTAL CASES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 50p., 1974. 14 refs. (Presented at the Air Pollution Control Associaton, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-106.)*

Procedures for the accumulation of data and documentation of admissible evidence for environmental cases are outlined. Topics covered include: functions of the judge and jury, burden of proof, amount of proof required, best evidence rule, kinds of evidence and/or substitutes for evidence, admissibility of evidence, record keeping, and record documentation. Copies of records used are illustrated for the following general categories: general field data reports; solid waste inspections; special field sample reports (including air sample reports, plume observation records, hi-volume sample packets); internal laboratory identification reports; summary laboratory reports accompanied by narrative (including ambient air samples, calculation of hi-volume samples, fall out sample data, and air sample analysis); certification request forms; and compiliation of evidence (including profiled sample results, pertinent pictures and maps, reports of investigations, correspondence with management, documents showing progress, and historical summaries).

48543 **APTIC NO. 69474**

Peters, John C.

METHODOLOGIES USED IN THE PREPARATION OF ENVIRONMENTAL STATEMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1974. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974.)*

Methodologies used in the preparation of environmental impact statements are reviewed. The National Environmental Policy Act requires federal agencies to prepare such statements on all major federal actions significantly affecting the quality of the environment. Agency instructions for preparing environmental statements are the result of interaction between the Act (legislative action), court decisions (legal actions), and Council on Environmental Quality guidelines (executive action). Part of the content of any environmental impact statement must include the following topics: the environmental impacts of the proposed action, any adverse environmental effects which cannot be avoided, alternatives to the proposed action, the relationship between local short-term uses of man s environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the action.

48544 **APTIC NO. 70288**

Reinker, D.

AIR HYGIENE INSPECTIONS OF OIL-FIRED HEATERS - EXPERIENCES, RESULTS, PROSPECTS. *(Die lufthygienische Kontrolle von Oelfeuerungen - Erfahrungen, Resultate, Aussichten). Text in German. Luft und Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 38-38. (June.)*

Inspections of oil-fired heaters have the purpose of properly adjusting the systems with regard to soot emission and the emission of unburned hydrocarbons in the flue gas. If this is not feasible, a replacement by less polluting heaters is requested. Contrary to the visual inspections of 10 or 15 years ago, measurements are now taken. Part of the flue gas is drawn off with manual pumps and passed through a filter. The deposits on the filter are then evaluated. The problems of control measurements with regard to measuring point, timing, and equipment are briefly outlined. In the Kanton Baselland annual inspections of all non-industrial oil-fired heaters have been carried out by the municipalities since March 5, 1973. Inspections of oil-fired heaters of some of the municipalities of the Kanton were begun as early as 1966. The percentage of systems operating flawlessly rose gradually over the period the inspections were carried out so that with the spread of such inspections to other Kantons air pollution by domestic heating with oil can be expected to decrease.

48545 **APTIC NO. 70290**

Rivar, R.

ORGANIZATION OF THE INSPECTION OF OIL-FIRED HEATERS FROM THE VIEW OF KANTONAL AND COMMUNAL ADMINISTRATION. *(Die Organisation einer Oelfeuerungskontrolle aus der Sicht der kantonalen und der kommunalen Verwaltung). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 46-53. 1 ref. (June.)*

Passage of the guideline concerning the limitation of emissions from domestic and industrial firing systems on Feb. 7, 1972 by the Swiss Department of the Interior (Eidgenoessisches Department des Innern) has created a solid basis for an effective inspection of oil-fired heaters. The individual Kantons will now have to issue regulations concerning details of the inspections, such as the tasks of the owner and the organization and execution of the inspections. Execution of the inspections will be the task of the municipalities. A kantonal supervisory body will support the municipalities in their attempt to organize the inspections and see to it that the inspections be carried out uniformly and expertly. The municipalities will take advantage of two kinds of forms, one recording all details of the individual inspection and one an annual report. Samples for the two forms are given.

48546 **APTIC NO. 70162**

Rosenbloom, Sandra

REDUCTION OF TRAFFIC CONGESTION; A SUMMARY OF A STATE-OF-THE-ART ANALYSIS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 295-321. (Sept. 25-27.)*

An analysis of social, socio-economic, socio-technical, and technical approaches to meeting peak period traffic congestion problems suggests that the benefits of proposed schemes to reduce traffic congestion promise greater effectiveness than appears to be realized in actual practice. An appraisal of available options indicates that those which rely on increasing the capacity of the transportation system to recent growing peak period demands will generally yield only localized and short- lived benefits. Techniques which promise the greatest reduction in peak period traffic congestion are long-range solutions which modify the urban form in ways that reduce the need for travel as well as the need for automobiles for most trips. Although several solutions explored appear to offer only very modest improvements to peak period traffic flow individually, many can be implemented simultaneously and are mutually supportive. Some of the approaches reviewed include: land use planning, pricing and regulatory mechanisms, mass transportation improvements, and traffic engineering.

48547 **APTIC NO. 65523**

Samuelsen, G. S.

CONSORTIA ACTIVITIES IN SUPPORT OF HIGHER EDUCATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1974. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-165.)*

University air pollution consortia activities in support of higher education are described. They were created with the goals of promoting communication and understanding among the many disciplines concerned with environmental quality, conserving scarce funds by reducing ducplication, and improving the quality of education in the environmental sciences. The activities of the consortia and details and examples of the means by which consortia have contributed to higher education are presented under the broad categories of resource sharing, contribution to the educational process, information exchange, and university support of the consortium. Studying pollution control through the auspices of various universities will more effectively prepare students and faculty to deal with environmental issues in a professional manner. Extant consortia are specifically mentioned.

48548 **APTIC NO. 70289**

Schaetzle, P.

THE TRAINING OF INSPECTORS FOR OIL-FIRED HEATERS. *(Die Ausbildung von Oelfeuerungskontrolleuren). Text in German. Luft Wasser, Pro Aqua - Pro Vita Conf., Basel, Switzerland, 1974, p. 39-45. (June.)*

After a large number of municipalities in Switzerland had introduced mandatory inspections of oil-fired heating systems for the purpose of reducing the emission of unburned hydrocarbons and soot by ill-adjusted burners, it turned out that the assigned personnel were not prepared for the task. Inspectors and personnel installing the heaters obtained different measurement results or interpreted the same results differently. It was therefore decided to create a commission in which experts of administration, science, and of the manufacturers were represented with the task of working out a teaching program for future inspectors. To date 700 inspectors have been trained.

48549 **APTIC NO. 66795**

Schlesinger, B. and W. S. Gray

AN INTRODUCTION TO ENVIRONMENTAL IMPACT STATEMENTS - GOALS, EVOLUTION AND ISSUES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1974. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-203.)*

Environmental Impact Statements (EIS) are reviewed. Original expectations and goals of the National Environmental Policy Act of 1969 and relationships and practices that have evolved over the past 4 years are compared. The developing role of the EIS in preliminary project planning and organization is discussed. Several key issues surrounding the EIS are explored, including: changing expectations of EIS content, the full-disclosure concept and public review, and emerging agency functions. Impact statement goals and processes that are likely to evolve over the next few years in the face of impending energy supply deficits are discussed. (Author abstract modified)

48550 **APTIC NO. 69196**

Shintani, Kozo

THE PRESENT CONDITION AND THE FUTURE DIRECTION OF PHOTOCHEMICAL SMOG COUNTERMEASURES. *(Kokagaku sumoggu taisaku no genjo to kongo no hoko). Text in Japanese. PPM (Japan), 5(9):70-77, Sept. 1974. 4 refs.*

The present status and future developments in photochemical smog control in Japan are surveyed. The goal is to keep the photochemical oxidant concentration below 0.06 ppm (one-hour value). Because of the paucity of measurements over a period of years, the overall variations in carbon dioxide, hydrocarbons, and oxidant concentrations do not show a definite trend. Nonetheless, certain regions are more susceptible to pollution increase than others. From April to October 1973, there were 328 cases of oxidant alerts in Japan peaking during June, July, and August. Smog alert laws have been enacted since 1970 to control atmospheric pollution whenever the one-hour oxidant concentration value exceeds or may exceed 0.15 ppm. An oxidant concentration value of 0.5 ppm per hour creates a state of extreme emergency. On May 8, 1973, further regulations were promulgated to control nitrogen dioxide, nitrogen oxides, and photochemical oxidant concentrations. Further automobile exhaust control regulations will go into effect in 1975. The various causes, components, and effects of photochemical smog are under investigation by many groups. The foremost example of international cooperation is the Japan-United States Photochemical Atmospheric Pollution Committee. In second place is AMSG (Atmospheric Management Sector Group) of OECD.

48551 **APTIC NO. 70171**

Shutler, N. D.

CONTROL OF EMISSION CONTROL TAMPERING. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 483-499. (Sept. 25-27.)*

Enforcement activities of the Environmental Protection Agency regarding tampering with emission control systems on automobiles are reviewed. Tampering surveys of the Agency conducted on 1970-1974 vehicles in the District of Columbia indicated that about 15% of such vehicles had at least part of the emission control systems removed or disconnected, ranging from 3% for 1974 vehicles to 21% for 1970 vehicles. A New Jersey survey roughly confirmed the results of the District of Columbia survey. More than 100 tampering investigations have been performed by the Agency since 1972, with several referrals to the Justice Department. One case in which a dealer removed and bypassed various emission control system components was carried through to prosecution, with a penalty of $500 being assessed against the dealer. The sale of a nationwide emission control bypass manual has been referred to the 50 state Attorneys General for possible prosecution and to the Post Office for possible mail fraud prosecution. The EPA utilizes consumer complaints, magazine and news articles, tips from public interest groups, and information from state control agencies to zero in on potential tamperers.

48552 **APTIC NO. 69629**

Shy, Carl M., Wilson B. Riggan, Jean G. French, William C. Nelson, Richard C. Dickerson, Ferris B. Benson, John F. Finklea, Anthony V. Colucci, Douglas I. Hammer, and Vaun A. Newill

AN OVERVIEW OF CHESS. *In: Health Consequences of Sulfur Oxides: A Report From CHESS, 1970-1971. Environmental Protection Agency, Research Triangle Park, N.C., National Environmental Research Center, EPA-650/1-74-004, p. 1-1 to 1-9, May 1974. 3 refs.*

NTIS: PB 234 920/AS

The Community Health and Environmental Surveillance System (CHESS) program is described. The structure, rational, method to relate environmental exposure to human health effects, and various study strategies to implement this program are described. The CHESS program is a program of standardized epidemiologic studies to measure simultaneously environmental quality and sensitive health indicators in sets of communities representing exposure gradients to common air pollutants. Health indicators, environmental monitoring devices for various pollutants, and data analysis are described. (Author summary modified)

48553 **APTIC NO. 65522**

Stukel, J. J.

UNIVERSITY CONSORTIA--A NATIONAL RESOURCE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1974. 1 ref. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-164.)*

Programs of the six university Consortia in support of industry, higher education, governmental agencies, and the public sector are summarized. Activities in support of industry include dissemination of information including directories and special publications and education and training. Activities in support of higher education include: improving the quality of courses taught at the member universities, supporting visiting scientists and faculty exchange programs, and providing student support. University level courses covering land use planning, atmospheric turbulence and diffusion, chemical analysis of pollutants, source sampling, and environmental source control technology were developed. Activities in support of agencies include: supporting internships, providing technical assistance, gathering information, and providing continuing education opportunities. Vigorous programs for the public sector were developed including sponsoring public forums, sponsoring radio and television programs, presentations on the local pollution situation to public interest groups, projects related to improving the effectiveness of local government in the area of pollution control, and initiating and organizing a symposium on protocol for solution of air pollution problems along the U. S. Mexico border.

48554 **APTIC NO. 67049**

Suschka, Jan

ENVIRONMENTAL MONITORING IN SILESIA. NEEDS, PROBLEMS AND POSSIBLE APPROACHES. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 17, p. 327-346.*

Environmental monitoring in the Silesia region of the USSR is reviewed. The characteristics of the region, the extent of the monitoring, indispensable information required, sources, data collection methods, data handling systems, meteorological data, water and air pollution information, and data bank organization and equipment are described.

48555 **APTIC NO. 70249**

Suzuki, Noboru

THE PRESENT STATE OF THE JAPAN SOCIETY FOR ENVIRONMENTAL MEASUREMENT ANALYSIS (NON-PROFIT). *(Shadan hojin, Nihon Kankyo sokutei Bunseki Kyokai no genkyo ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(7):63-70, July 1974.*

The Japan Society for Environmental Measurement Analysis was established on Nov. 22, 1973, and was sponsored by 52 companies and agencies. The main businesses of the society are: promotion of the standardization of environmental measurement and analysis techniques; preparation of the standards for facilities and equipment; information exchange; training of technicians; promotion of the utilization of large, highly capable apparatuses; establishment of a loan policy; and making recommendations to related government agencies. Five special committees were formed in the same year to investigate and study related matters such as pollution regulations. Business plans for 1974 are to accomplish at least part of the goals, including the opening of 5-day seminar in large cities.

48556 **APTIC NO. 69296**

Takamatsu, Takeichiro

ENVIRONMENTAL SYSTEM CONTROL STRUCTURE AND PROBLEMS. *(Kankyo shisutemu seigyo no koso to kaiketsu subeki shomondai). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 154-160, 1974. (Presented at the Symposium on Systems Engineering for Environmental Control, Toyama, Japan, July 18, 1974.)*

Feed-back and feed-forward air pollution control systems are described. It is desirable to separate the control system into short-term and long-term systems. For a short-term control system, if the hourly average concentration is over a certain level, for instance, 0.2 ppm, the operation of the activity system must be adjusted to reduce the total emission. For a long-term control system, the environmental conditions must be adjusted to see if the annual pollution concentration is satisfactory. Thirteen research projects on environment by

Unesco man and biosphere plan are also briefly described. The projects include: ecological effects of increasing human activities on tropical and subtropical forest ecosystems; ecological effects of different land uses and management practices on temperate and Mediterranean forest landscapes; the impact of human activities and land use practices on grazing lands; impact of human activities on the dynamics of arid and semi-arid zone s ecosystems, with particular attention to the effects of irrigation; ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones; the impact of human activities on mountain ecosystems; ecology and rational use of island ecosystems; conservation of national areas and of the genetic material they contain; ecological assessment of the pest management and fertilizer use on terrestrial and aquatic ecosystems; effects on man and his environment of major engineering works; ecological aspects of energy utilization in urban and industrial systems; interactions between environmental transformations and genetic and demographic change; and perception of environmental quality.

48557 **APTIC NO. 70119**

Train, Russell E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. PROPOSED SELECTIVE ENFORCEMENT AUDITING PROCEDURES. *Federal Register, 39(252):45360-45380, Dec. 31, 1974.*

A proposal to revise Part 85 of Title 40 of the Code of Federal Regulations by addition of a new subpart and amendments to existing subparts is given. The major purpose of the revision is to verify on a selective basis that new gasoline-fueled and diesel light duty vehicles and new gasoline-fueled and diesel light duty trucks conform at the assembly line with the regulations with respect to which the certificate of conformity was issued. Certification is the principal tool used for enforcement of emission standards and is based on the emission performance of a limited number of prototype vehicles. The regulations proposed will prevent future nonconformity so that prototype vehicle emissions will accurately reflect emissions from production vehicles. The new regulations involve Selective Enforcement Auditing (SEA). The regulations, the selection of vehicles for testing, test procedures, mileage accumulation, mile deterioration factors, sampling and inspection criteria, noncompliance with a test order, an example, and hearing procedures are reviewed.

48558 **APTIC NO. 69223**

Watanabe, Kazuo

PRESENT STATUS OF LEGAL REGULATIONS OF BAD ODORS. *(Akushu kisei no genjo ni tsuite). Text in Japanese. PPM (Japan), 5(10): 74-80, Oct. 1974.*

Odor regulation laws became effective on June 1, 1971. The methods of control of bad odors, the actual state of practice of this law, examples of various industries, and future plans for odor control are reviewed. Legal regulations are given for ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethylamine. The regulations are given according to the strength of odors, which are classified into 6 grades; no smell, hardly noticed, weak but identifiable, easily sensible, strong odor, and very bad odor. For instrumental determination, gas chromatography is adopted. According to the results of measurements, almost 30% of chemical plants such as cellophane, rayon, and rubber production plants discharged gases containing more than 5 ppm ammonia. Animal husbandry sources also discharged gases rich in ammonia. Thus, 51% of the plants discharged gases containing more than 1 ppm NH3, 21% discharged more than 2 ppm, and 3% discharged gases containing more than 3 ppm. Similar data were also tabulated for four other substances. The districts where the bad odor prevention law is applied are also tabulated. In the near future, acetaldehyde, dimethylamine, and dimethyl sulfide shall be taken up as objects of the odor law. Organic solvents are also being discussed.

48559 **APTIC NO. 69336**

Yeager, Kurt E.

FUTURE ENERGY R AND D PROGRAM OF EPA. *Pollution Engineering Magazine; Power Engineering Magazine; Research/Development Magazine; and Government Institutes, Inc., Washington, D. C., Energy R D Present Future Annu. Conf., 1st, Proc., Washington, D. C., 1974, p. 187-225. (June 20-21.)*

The general role of environmental research and the role of the Environmental Protection Agency (EPA) in the achievement of energy self-sufficiency are discussed. The role is based on the Federal position that the development and implementation of energy technology and policy must be sensitive to effects on health and the environment. If this sensitivity is rationally incorporated into the energy development process, self-sufficiency can be achieved in harmony with the environment. The fundamental goals of the Federal energy-related research program are to: fundamentally improve understanding of the environmental impact of energy self-sufficiency; determine the relationship between source control and impact reduction in social, economic, and environmental terms; and translate these research efforts in a manner which permits the public and its representatives to make policy decisions based on the knowledge of the total costs and benefits of various approaches to energy self-sufficiency. Major environmental problems and research to solve them are summarized. The research objectives and associated resource allocations, based on a $191 million increase in the 1975 fiscal year EPA research appropriation, are described in terms of seven major environmental research program areas: pollutant characterization and control assessment; measurement and monitoring; pollutant transport processes; health effects; ecological, welfare, and social effects; control technology development; and environmental analysis and policy formulation. (Author abstract modified)

48560 **APTIC NO. 67052**

World Meteorological Organization

WMO ENVIRONMENTAL MONITORING SYSTEMS AND NETWORK DESIGN FOR ENVIRONMENTAL CONTROL. *In: Design of Environmental Information Systems. Rolf A. Deininger (ed.), Ann Arbor, Mich., Ann Arbor Science Publishers, 1974, Chapt. 22, p. 405-413. 15 refs.*

The range of the World Meteorological Organizations (WMO) activities in the environmental issues involving environmental information systems is discussed. The most all-embracing environmental system is the World Weather Watch operated by the WMO which is a world-wide, coordinated development system of meteorological services. The three principal elements of the Watch for obtaining information are the Global Observing System, the Global Data-Processing System, and the Global Telecommunication System. The Global Atmospheric Research Program is another major activity within the WMO research program. The WMO also conducts atmospheric, marine, and inland water monitoring.

48561 **APTIC NO. 69239**

Federal Republic of Germany

LAW FOR THE PROTECTION AGAINST HARMFUL ENVIRONMENTAL EFFECTS BY AIR POLLUTANTS, NOISE, VIBRATIONS AND SIMILAR PROCESSES, FEDERAL EMISSION PROTECTION LAW. *(Gesetz zu, Schutz vor schaedlichen Umwelteinwirkungen durch Luftverunreinigungen, Geraeusche, Erschuetterungen und aehnliche Vorgaenge, Bundes- immissionsschutzgesetz). Text in German. 54p., March 15, 1974.*

The emission protection law comprises seven parts. Part one outlines the purpose of the law and defines terms. The main purpose of the law is to protect against and prevent harmful environmental pollution. It provides a uniform basis for protective measures against emissions throughout the country.

The regulations of the law are addressed to the erection and operation of industrial plants, the manufacture and production of equipment, fuels and gasolines; to the design operation, and testing of automobiles, railroads, airplanes and boats; to the construction of public streets; and to railroads and street cars. The regulations are not valid for airports, nuclear fuels, and other radioactive substances. Plants requiring an operating license and those requiring none are described. Plants which require no operating license still are requested to design and operate their equipment in a way which prevents environmental pollution as far as possible. Unavoidable pollution must be reduced to a minimum. The production of mass goods, emissions from traffic, and the monitoring of air pollution in the Federal Republic of Germany are also included in the law. An important novelty in the administrative sector is the demand for a plant appointee concerned with emission protection.

48562 **APTIC NO. 69913**

Environmental Protection Agency, Research Triangle Park, N. C., Air Pollution Technical Information Center

APTIC NETWORK SEARCH-EDIT-RETRIEVAL SYSTEM (ANSERS). TERMINAL USERS MANUAL. GUIDELINE DOCUMENT. *Preprint, 33p., Sept. 1974.*

Instructions are given for searching the Air Pollution Technical Information Center (APTIC) bibliographic data base with the Technical and Environmental Information System (TENIS) information retrieval system on a UNIVAC 1110 computer. The computer search process is explained, the user s search procedure is outlined, search criteria are described, examples of search procedure are given, and use of the microthesaurus terms are explained.

48563 **APTIC NO. 69962**

Research Triangle Inst., Research Triangle Park, N. C.

STATE AIR DATA INFORMATION SURVEY FINAL REPORT. *Office of Air and Waste Management Contract 68-02-1096, Program Element 2AE132, Rept. EPA-450/3-74-057, 103p., Sept. 1974. 4 refs.*

NTIS: PB 238477/AS

An update of a state air data information survey conducted under the auspices of the National Air Data Branch of the Environmental Protection Agency is presented. The survey was conducted to obtain information describing the scope and size of state systems for handling emission inventory and air quality data and for identifying problems associated with the normal use of such systems. Manual emission inventory systems are currently being used by 37 state agencies, and only 32% of these agencies indicate satisfaction with such systems. At least 76% of all agencies have, or could have, access to computer facilities which would benefit the collection, storage, maintenance, and access of emissions data. Approximately 52% of the state agencies have computer-based air quality data systems. All agencies have air quality data systems which are essentially compatible with SAROAD. The SAROAD-perfected input formats are used by at least 64% of the state agencies, and SAROAD reporting formats are being used by at least 95% of the agencies. All agencies are aware of the Federal reporting requirements, although few agencies having manual systems have prepared semi-annual reports. Less than 18% of the agencies responded that Federal reporting impacted their operations when answering a questionnaire. A sample survey questionnaire is presented and discussed.

48564 **APTIC NO. 70053**

Ministry at the Interior (Germany), Technical Committee on Air

FIRST GENERAL ADMINISTRATIVE REGULATION UNDER THE FEDERAL IMMISSIONS CONTROL ACT. (TECHNICAL INSTRUCTION FOR MAINTAINING AIR PURITY -- TECHNICAL COMMITTEE ON AIR) OF AUGUST 28, 1974. *Gemeinsames Minist., 25(24):426-452, Sept. 4, 1974. Translated from German, 81p.*

The general administrative regulation under the Federal Emissions Control Act of March 15, 1974 of West Germany is presented. Definitions and units for the measurement of air pollutants, emissions, and immissions are given. General provisions on the maintenance of air purity and governing approval, preliminary decisions, and supplementary directives are given. Applications for approval of the construction and operation of new facilities, for the issuance of partial approval, for approval of appreciable alteration of the location or operation of a facility, and for issuance of a preliminary decision are listed. Emission and immission limits are given for dark smoke, dusts, and gases. Methods for determining immissions, determination of minimum stack height, dispersion calculations, and monitoring stations and programs are also reviewed.

1973

48565 **APTIC NO. 75042**

Detrie, Jean-Paul

THE ROLE OF THE CITEPA IN PROVIDING INFORMATION FOR BETTER PROTECTION OF THE ENVIRONMENT. *(Connaitre et informer pour mieux proteger l environnement. Role du C.I.T.E.P.A.). Centre Interprofessionel Technique d Etudes de la Pollution Atmospherique, Paris (France), 1973 (?). Translated from French, 7p.*

The Centre Interprofessionel Technique d Etudes de la Pollution Atmospherique (CITEPA) (Interprofessional Technical Center for Research on Atmospheric Pollution) was set up as an independent organization by the Comite d Action Technique contre la Pollution Atmospheric under the auspices of the French Fuel and Energy Institute in 1961. The studies of the CITEPA have been primarily directed toward the development of standard measurement methods, the study of control methods and dispersion, and the collection and distribution of information. The organization s research, documentation and information collection efforts, and administration are reviewed.

48566 **APTIC NO. 70128**

Goeller, Bruce F.

SAN DIEGO CLEAN AIR PROJECT: SUMMARY REPORT. *Environmental Development Agency, San Diego County, Calif., Office of Environmental Management and Rand Corp., Santa Monica, Calif., Environmental Protection Agency Grant, Rept. R-1362-SD, 147p., Dec. 1973. 89 refs.*

NTIS: PB 232510

Alternative air pollution control strategies for the San Diego Clean Air Project are analyzed in terms of their various environmental, transportational, economic, and distributional impacts on the region. An overall strategy for the region, termed a mixed strategy, is presented which combines three types of pure strategy: fixed-source controls, including airports (maintenance, process modification, control equipment), retrofit devices and inspection/maintenance policies for light-duty motor vehicles, and transportation management. The cost of a strategy for procurement and operation is annualized, and its effectiveness is calculated in terms of reduced emissions (primarily photochemically-reactive hydrocarbons). The maximal control strategy for fixed sources reduces the reactive hydrocarbon emissions more than 19,000 tons from the uncontrolled level for an annualized cost of about $2.67 million ($140/ton), while the maximum strategy for retrofit inspection/maintenance reduces hydrocarbons from light duty motor vehicles by more than 25,000 tons at an annualized cost of about $102 million ($4000/ton). The effectiveness of a strategy involving transportation management is strongly dependent on the extensiveness of whatever retrofit strategy is applied. An annualized expenditure of about $20 million is required to produce a 5% reduction in light-duty motor vehicle mileage by either bus improvement or mileage surcharge.

48567 **APTIC NO. 69465**

Grant, W. J.

CANADIAN POLLUTION AUTHORITIES AND REQUIREMENTS. *Preprint, American Inst. of Chemical Engineers, New York, 20., 1973. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 15, 1973.)*

Pollution legislation and enforcement authorities in Canada are outlined along with activities of the Petroleum Association for Conservation of the Environment. The Environmental Protection Act of 1971 is the most general piece of Canadian pollution legislation, and the Environmental Protection Service is the action arm of government policy. The Clean Air Act permits the federal government to set national air quality objectives and to cooperate with the provinces in several key areas such as monitoring and research. Federal intervention in air pollution control is permitted when there is a significant danger to public health or when international agreements are involved. National air quality of objectives have been established for sulfur dioxide, particulates, carbon monoxide, and total oxidants. Nitrogen oxides and hydrocarbons are currently under consideration. The Petroleum Association for Conservation of the Environment represents all phases of the petroleum industry in Canada and maintains standing sub-committees on air and water pollution, liquid wastes, oil spills, legislation, public relations, and research.

48568 **APTIC NO. 69425**

Grimes, Maria H.

AIR POLLUTION. *In: Congress and the Nation s Environment. Environmental and Natural Resources Affairs of the 92d Congress. 93rd Congress (Senate), 1st Session, p. 623-647, Jan. 20, 1973. 20 refs. (Prepared by the Environmental Policy Division, Congressional Research Service, Library of Congress at the request of the Committee on Interior and Insular Affairs.)*

GPO

The actions of the 92nd Congress with respect to the environment are reviewed. The present air pollution control law, Public Law 91-604, the Clean Air Act Amendments of 1970, was signed only a few days before the 92nd Congress convened. No air pollution control legislation was enacted in 1971 or 1972. Instead, individual members and committees of both Houses moved to monitor its implementation, and addressed themselves to problems which arose as Federal, State, and local agencies sought to carry out the provisions of the act. Oversight hearings were held regarding various oversights of the Clean Air Act Amendments. The Environmental Protection Agency was requested to respond to various charges regarding stationary sources, state implementation plans, emission standards, deterioration of air quality, regulation of aircraft emissions, environmental impact statements of Federal activities, emission reductions for mobile sources, alternative automotive propulsion systems, and control technology and testing procedures for mobile sources. Other hearings were conducted on problems of electrical power production in the Southwest, solid waste disposal, and economic incentives to control pollution. Funding, legislative proposals, and recent reports and their recommendations are also described.

48569 **APTIC NO. 69624**

Harowski, Tom, Michael Tomaszewicz, Barbara Eisler, and Eleanor Lewis

OPTIONS FOR UNCLOGGING THE CORRIDOR STATE: A WHITE PAPER ON NEW JERSEY S ENVIRONMENTAL-TRANSPORTATION PROBLEMS. *In: EPA Pollution Regulations and Fuel Shortage: The Impact on Mass Transit. Inst. for Public Transportation, New York, 93rd Congress (House of Representatives), 1st Session, p. 231-277, 1973. 24 refs. (Hearings before the Subcommittee on Urban Mass Transportation of the Committee on Banking and Currency, July 26-31, 1973.) (Presented at the New Jersey Citizens for Clean Air Conference on Unclogging the Corridor State, East Brunswick, N. J., April 14, 1973.)*

The transportation and environmental problems in New Jersey which require the adoption of a new policy are discussed. New Jersey s position in the the northeast travel corridor and its high population density have caused many of the problems. The enactment of the Federal Clean Air Act Amendments of 1970 gave added urgency to the solution of New Jersey s transportation problems, because they set up Federal standards for six air pollutants -- four of which are predominantly automobile related and required filing of an implementation plan. The impact of the automobile on air pollution is discussed. Motor vehicles in New Jersey contribute 97% of the hydrocarbons, 71% of the carbon monoxide, 62% of the nitrogen dioxide and 90% of the lead in the air. The automobile also effects noise pollution, land use, natural resource use, commuter costs, highway deaths, the energy crisis, and transportation. Data are given on the use of the highway system, trains, buses, and land in New Jersey today. Current and future policies are described. A model is discussed to predict quantities of air pollutants emitted from automobiles between 1970 and 1990. Transportation controls are reviewed which might reduce pollution, including inspection, maintenance, retrofit, gaseous fuel systems, traffic flow techniques, bypassing thru traffic, improvements in public transportation, motor vehicle restraint, biking and walking, work schedule changes, and decreasing new highway construction. The relationships between transportation and land use, jobs, and goods movement are discussed. Mass transportation, mass transit financing, user taxes, general state and local sources special surcharges, and railroad management are also reviewed.

48570 **APTIC NO. 69614**

Hinton, Merrill G., Toru Iura, and Joseph Meltzer

EXAMINATION OF ISSUES RELATED TO TWO-CAR REGIONAL EMISSION CONTROL STRATEGIES: VOLUME I - EXECUTIVE SUMMARY (FINAL REPORT). *Aerospace Corp., El Segundo, Calif., Office of Air and Waste Management Contract 68-01-0417, ATR-73(7324)-1, EPA-460/3-74-029-a, 39p., April 1973.*

NTIS: PB 238 553/AS

Available information pertaining to the potential implementation of a one-year, two-car regional emission control strategy for the 1975 model year is examined and summarized. Two two-car strategy options were specified by the Environmental Protection Agency for examinaton: a California-only strategy whereby cars conforming to the 1975 federal emission standards would be used in California only while cars conforming to the 1973/4 standards would be used in other states; a California-plus strategy whereby low-emission cars would be used in California and other selected areas, with higher emission cars being used in the remaining parts of the country. The California-only strategy would require approximately 11% of the 1975 model year passenger cars sold in the United States to meet the lower emisson standards, with most vehicles requiring catalysts to achieve these standards. The California-plus strategy would require up to 33% of the 1975 vehicles to meet the lower emission standards. Under either of these one-year control strategies, there is no dramatic improvement in air quality projected for control regions with the lower emission cars.

48571 **APTIC NO. 69912**

Kaplow, Paul M.

JET POLLUTERS AND THE GOVERNMENT: WHAT THEY VE DONE TO THE FRIENDLY SKIES. *Ecol. Law Q., 3(3):639-677, 1973. 184 refs.*

Experience with administrative law suggests that agencies regulate most effectively only when public attention is focused on their activities. Recognizing this, environmental activists have thus far relied extensively on public pressure to urge regulation, although environmental preservation involves a complex blend of technical disciplines. Aircraft emissions are discussed as related to legislation and regulations. Aircraft emissions are a problem whose engineering and scientific complexities often contradict common sense conclusions. Public pressure has been ineffective in formulating a complete solution to the problem of aircraft emissions and initially aggravated the problem. Legal and technological process and problems in controlling aircraft emissions are analyzed. Weaknesses in the current enforcement scheme are reviewed, and alternatives for future regulations that are consistent with air pollution reduction and fuel conservation are discussed. Methods to control aircraft emissions are also described, including engine modifications and modifications of ground operations. (Author abstract modified)

48572 **APTIC NO. 68432**

Koyama, Hitoshi

POLLUTION BY URBAN HIGHWAYS AND THE CITIZENS MOVEMENT. *(Toshi kosoku doro no kogai to jumin undo). Text in Japanese. Kogai Kenkyu (Stud. Publ. Nuisance), 3(2):28-36, Oct. 1973.*

Uncontrolled highway development jeopardizes the quality of life in Japan. As an example, the building of the highway from Osaka to Kobe is discussed. Citizen involvement to combat the problem is urged.

48573 **APTIC NO. 70175**

Krenke, Georg and Dieter Schoelzke

ON-LINE COMPUTER INTEGRATED IN AN ENVIRONMENTAL MONITORING NETWORK. *(Prozessrechnereinsatz in einem Umweltueberwachungsnetz). Text in German. Siemens Z., 47(9):641-645, Sept. 1973.*

A pilot scale experimental network for air and water quality monitoring incorporating an on-line computer center is described. The monitoring network includes a Siemens model 320 on-line computer and model Z 20 remote control unit. Each station is connected to its own receiver in the computer center for maximum safety and high performance. The measurement data that are fed to the center at regular intervals or even sporadically between two subsequent calls are checked for plausibility and are used for the computation of 30-minute-averages. The sampling stations, their functional state, and calibration are controlled and checked by the central computer. The experimental network is designed to measure the concentrations of hydrocarbons, carbon monoxide, carbon dioxide, dust, ozone, sulfur dioxide, and nitrogen oxides, as well as such meteorological parameters as humidity, temperature, wind direction, wind velocity, and pressure. The measurement of further parameters is also possible. The measurement data can be stored on magnetic bands for off-line evaluation.

48574 **APTIC NO. 69790**

Lack, J. C. and W. J. Schnitzler

REVIEW OF MONITORING DATA AVAILABLE FROM THE ALBERTA DEPARTMENT OF THE ENVIRONMENT: WITH SPECIFIC TABULATIONS FOR SOURCE GAS PROCESSING PLANTS. *Environment Canada, Edmonton (Alberta), Canadian Forestry Service and Northern Forest Research Centre, and Alberta Environment, Research Secretariat, Proc. Workshop Sulphur Gas Res. Alberta, Edmonton, Alberta, 1973, p. 146-188. 4 refs. (Nov. 1-2.)*

The current air quality monitoring being conducted in Alberta, Canada for sour gas processing plants is described. The minimum requirement guidelines which have been established for all Air Licences issued to sour gas plants are summarized. These requirements apply to all new and existing plants. The Air Monitoring Directives which have been issued during 1972 and 1973 are listed. The current air quality monitoring programs discussed included continuous ambient monitoring, static ambient monitoring, and continuous, static, and stack emission source monitoring. Air quality reporting requirements are also discussed. (Author abstract modified)

48575 **APTIC NO. 56494**

Murase, Akira, Norio Oikawa, Yasuo Itazaki, Kenji Toba, Takashi Ogura, Akira Okada, and Kosei Shimabukuro

AIR POLLUTION AND SOURCE MONITORING SYSTEM IN KAWASAKI CITY. *(Kawasaki-shi taiki osen oyabi hasseigen kanshi a shisutemu). Text in Japanese. Fujitsu (Sci. Tech. J.), 24(1):19-42, 1973.*

The air pollution and source monitoring system in Kawasaki City is described. Data related to measurement of pollutants measured at seven fixed stations are continually fed by telemeter in digital format to the central pollution center. These measurements include sulfur dioxide, oxidants, suspended particulate matter, nitric oxide, nitrous oxide, carbon monoxide, total hydrocarbon, saturated hydrocarbons, emissions from motor vehicles and industry as well as weather conditions like wind speed and direction, temperature, and humidity. Forty-two large plants in Kawasaki emit over 90% of total sulfur oxide. Data on fuel consumption, concentration of SO2 during combustion, and percentage of sulfur in heavy oil measured at the 42 locations, are fed to the pollution control center by means of scanning digital telemter and the emission of SO2 is supervised. The data are processed weekly, monthly, seasonal, and annual reports are prepared.

48576 **APTIC NO. 69985**

Neuman, Barry S.

IMPLEMENTATION OF THE CLEAN AIR ACT: SHOULD NEPA APPLY TO THE ENVIRONMENTAL PROTECTION AGENCY? *Ecol. Law Q., 3(3):597-638, 1973. 211 refs.*

Environmentalists have found the National Environmental Policy Act (NEPA) to be an effective litigation tool in their efforts to prevent environmental degradation. The decision-making processes of nearly all Federal agencies have been affected, in form if not in substance, by NEPA. The only agency to avoid NEPA s procedural mechanisms is the institution charged with implementing the nation s major environmental improvement programs – the Environmental Protection Agency. With increasing frequency but with universal futility, industry has cited the agency s noncompliance with NEPA in challenging the Environmental Protection Agency s Clean Air Act programs. All courts which have considered the issue have agreed with EPA and held the Clean Air Act exempt from NEPA. Thus, the EPA has managed to avoid the institutional problems with NEPA has caused other agencies. But while the Clean Air Act has accordingly been immunized from this potential source of industry challenge, the cost of this immunization must be considered. The policy reasons for and against such an exemption are discussed. It is argued that the EPA and the Clean Air Act should comply with NEPA s purposes and provisions wherever possible.

48577 **APTIC NO. 68555**

Raja Rao, B. V. and N. G. Nair

SYSTEMS APPROACH TO AIR POLLUTION CONTROL AND URBAN PLANNING. *Syst. Approaches Dev. Ctry. Symp. Proc. Algiers, Algeria, 1973, p. 255-260. 15 refs. (May 28-31.)*

The results of investigations of the systems approach to air pollution control and urban planning are presented. The problem of environmental pollution and the associated ecological effects are briefly described. The concepts of systems approach and their applications to the current study are explained, and the problems of rural and urban planning resulting from rapid industrialization are discussed. The environmental impact should be considered in the selection of industrial sites. The design of processes and the manufacturing methods should be considered in the planning stages of industrialization. Environmental pollution problems from basic industries such as paper and pulp, foundries, iron and steel, and cement, are discussed. Some of the problems which a developing country should consider while planning to import technology from industrially advanced countries are described. (Author abstract modified)

48578 **APTIC NO. 66730**

California Air Resources Board

THE STATE OF CALIFORNIA IMPLEMENTATION PLAN FOR ACHIEVING AND MAINTAINING THE NATIONAL AMBIENT AIR QUALITY STANDARDS. REVISION 3. *64p., June 21, 1973.*

A revision to the California Implementation Plan for Achieving and Maintaining the National Ambient Air Quality Standards is presented which includes a reexamination of some of the control strategies proposed for consideration and some new strategies, changes to state laws and programs which were made after the Plan was submitted, and revised emission control strategies for the San Francisco Bay Area, San Diego, Sacramento Valley, and San Joaquin Valley Air Basins. Revisions to control strategy for emissions from stationary sources deal with agricultural burning, petroleum distribution and marketing, and organic solvent users. Revised control strategies for motor vehicles include: retrofitting exhaust controls on used vehicles, periodic vehicle inspection and mandatory maintenance, and more extensive conversion to gaseous fuels. Additions to control strategy include: catalytic converter retrofit devices, measures for reduction of vehicle usage, and land use planning. Revisions to program administration are also specified in relation to enforcement of the retrofit emission control program, general legal authority, research, and resources of the state Air Resources Board and local Air Pollution Control Districts.

48579 **APTIC NO. 70189**

Environmental Quality Commission, Pago Pago (American Samoa)

ENVIRONMENTAL QUALITY COMMISSION DOCUMENTS (FINAL REPORT). *66p., 1973.*

Various documents of the American Samoa Environmental Quality Commission are compiled. Topics covered include: regulations of the Environmental Quality Commission; the Commission s air pollution control implementation plan, including air emission rules and regulations; water quality standards; the Environmental Quality Act; summons of the Environmental Quality Commission; pollution control strategies and programs, including their enforcement; and various other regulations of the Commission. Emissions inventory data for the year 1970 are compiled for particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides. Estimated air quality data for 1970 are provided for particulates (44.6 micrograms/cu m) and sulfur dioxide (13.3 micrograms/cu m); since American Samoa is Priority III for all pollutants, no air quality data are estimated for carbon monoxide, photochemical oxidants, and nitrogen dioxides. Ambient air quality standards are listed for particulates, sulfur dioxide, carbon monoxide, oxidants, hydrocarbons, and nitric oxide in terms of yearly mean and yearly maximum. Both industrial and nonindustrial sources of pollution are considered, including the approval of new sources and modifications to existing sources.

1972

48580 **APTIC NO. 67040**

Blaine, J. C. D.

THE IMPACT OF AUTOMOTIVE TRANSPORTATION ON THE ENVIRONMENT AND LEGISLATIVE MEASURES FOR ITS CONTROL. UNITED STATES EXPERIENCE. *Int. J. Environ. Studies, vol. 3:243-252, 1972. 27 refs.*

Federal legislation to control automobile emissions is reviewed, with reference being made to the need for cooperative action among federal, state, and local governments, automobile and oil industries, and the general populace in the formulation and rigid enforcement of corrective environmental policies. Specific federal legislative measures reviewed include: The Clean Air Act of 1963, The Motor Vehicle Air Pollution Control Act of 1965, the National Emission Standards Act of 1967, and the Clean Air Amendments of 1970. Emission contributions by motor vehicles for the year 1968 are tabulated, showing that they accounted for 59.2% of the carbon monoxide emitted from all modes of transportation, 94.0% of the hydrocarbons, 88.9% of the nitrogen oxides, 37.5% of the sulfur oxides, and 66.7% of the particulate emissions.

48581 **APTIC NO. 69850**

Fujii, K.

SOME PROBLEMS OF THE PUBLIC NUISANCE ADMINISTRATION WITH SPECIAL REFERENCE TO THE ENVIRONMENTAL RIGHT. *(Kogai to kankyoken). Text in Japanese. Ube kogyo koto Senmon Gakko kenkyu Hokoku (Res. Rep. Ube Tech. Coll.), no. 16:47-52, Dec. 1972. 19 refs.*

Standing on the actual conditions of the establishment of a sequence of causes and effects between air pollution and the logic of probability caused from the judgements of Itai-itai disease and of Minamata disease, the advocacy of environmental right is being tried as a new problem of fundamental human rights. Though it is desirable that the logic of probability was introduced into a law system, it has not brought any decisive effects on environmental disruption now in progress. In and outside the country, the environmental problem has been getting popular, and at the same time, the laws for this problem has been consolidated. Since in Japan everything is in dense condition, so it may be necessary to introduce environmental right into the programme of fundamental rights first to the world.

48582 **APTIC NO. 66751**

Grandy, Richard D.

LEGISLATIVE AND REGULATORY TRENDS REGARDING AIR POLLUTION CONTROL AND PREVENTION. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 3, p. 79-227. 78 refs.*

Legislative and regulatory trends regarding air pollution control and prevention are reviewed. Topics considered include: the history of air pollution control legislation in the United States, including the Clean Air Act of 1963, the Motor Vehicle Air Pollution Control Act of 1964, the Air Quality Act of 1967, and the Clean Air Amendments of 1970; abatement authority and actions involving federal jurisdiction, private or class suits, and citizen suits; state and local emission standards pertaining to visible emissions, particulates, and sulfur oxides; material standards; ambient air quality standards; receptor standards, especially in connection with odors; air quality control regions; interstate compacts; air quality criteria for particulates, SOx hydrocarbons, photochemical oxidants, and nitrogen oxides; national ambient air quality standards; federal-state ambient air quality standards for carbon monoxide, particulates, SOx, hydrocarbons, photochemical oxidants, and NOx; new source performance standards for various industrial activities; implementation plans for air quality control regions; federal- state emission standards; the estimated impact of federal, state, and local air pollution control programs on industrial and nonindustrial emission sources; and pollution control tax incentives.

48583 **APTIC NO. 69796**

Ireland, F. E.

THE SCHEDULED PROCESSES. *Preprint, National Society for Clean Air, Brighton (England), Part 1, p. 1-10, Part 2, p. 40-56, 1972. (Presented at the National Society* *for Clean Air Annual Conference, 39th, Scarborough, England, Oct. 16-20, 1972.)*

The progress under the Alkali Act, organization of the Inspectorate, definitions under the Act, determination of the best practicable means for control of emissions under the Act, and the implementation of the best practicable means in various industries are reviewed. Case studies on the following industries are reviewed: sulfuric acid contact plants, nitric acid works, ceramic works, cement works, electricity works, iron and steel works, and miscellaneous works. A discussion of the paper is included.

48584 **APTIC NO. 67143**

Kassoff, Harold and David S. Gendell

AN APPROACH TO MULTIREGIONAL URBAN TRANSPORTATION POLICY PLANNING. *Highway Res. Rec., no. 348:76-93, 1973. 1 ref.*

An ongoing research and development project oriented toward providing an analytical framework for broad, policy-level, transporation investment decisions that simultaneously affect a large number of urban regions is described. The overall effort is known as the Transportation Resource Allocation Study. The urban area models that have been developed are capable of evaluating the economic and external consequences of alternative transportation investments. In addition to incorporating the traditional user-related items (such as time, operating, and accident costs), the model attempts to dimension the urban road construction impacts that are felt by the entire community. These include air pollution, displacement, and noise. The process, which is somewhat analagous to transportation planning at the local level, proceeds from a statement of land development and transportation investment alternatives and continues through travel generation on the basis of an equilibrium demand model, development of system performance measures, economic investment-return analysis, and evaluation that provides a framework for including non-costable constraints. The model system is capable of determining an optimum highway investment level, indicating the investment required to reach a specified performance level, and providing an indication of the consequences of alternative investment strategies. A separate set of models is under development for rural areas. (Author abstract)

48585 **APTIC NO. 69438**

Locklin, D. W., A. E. Weller, J. A. Hoess, and K. H. Jones

AN OVERVIEW OF RESEARCH NEEDS FOR AIR-POLLUTION CONTROL BY COMBUSTION-PROCESS MODIFICATION. *AIChE Symp. Ser., 68(126):1-13, 1972. 5 refs.*

A comprehensive 5 yr plan for effectively allocating resources available for combustion research and development aimed at meeting projected needs for air pollution control was developed. The plan is directed to the control of pollutant emissions from stationary and vehicular combustion sources through modification of combustion processes. The plant is organized by program elements identified by application areas or categories of major pollutant sources rather than by pollutants. Combustion sources include continuous combustion systems such as central station power plants, industrial processing, industrial steam generation, commercial and residential heating, and continuous combustion engines and cyclic combustion systems such as reciprocating internal combustion engines. Four major categories of pollutants were defined: products of incomplete combustion such as combustible particulate, carbon monoxide, gaseous hydrocarbons, polynuclear aromatics, and odor; nitrogen oxides; emissions resulting from combustion improving additives; and emissions from fuel contaminants including sulfur compounds, ash, and additives for stability or corrosion protection.

48586 **APTIC NO. 69898**

MITRE Corp., McLean, Va.

SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. SECOND DAY. SESSION ON ETHICS AND ENVIRONMENTAL ASPECTS OF THE DEMAND FOR AND USE OF ENERGY. VOL. 2. REVISION 1. *MITRE Rept. 72-69, 253p., Oct. 1972.*

NTIS: PB 213038

A transcript is given of the second day of a symposium on energy, resources, and the environment. The session discussed ethics and environmental aspects of the demand for and use of energy. The following subjects were discussed: national energy policy in terms of providing abundant, low cost, clean energy; the need for development of a consensual energy ethic; issues involved in developing energy and environmental ethics; energy, resource, and environmental issues and some changes to governmental institutions for dealing with the energy crisis; mechanisms for achieving cleaner power (prices, regulation, or direct public provision); and some environmental issues raised in previous meetings.

1961

48587 **APTIC NO. 67142**

Linsky, B. and G. Aase

FOUNDRY AIR POLLUTION CONTROL IN THE SAN FRANCISCO BAY AREA. *Mod. Castings, 40(5):111-116, Nov. 1961. 3 refs.*

A discussion is given of the basic needs of the San Francisco Bay Area Air Pollution Control District, covering such items as localized effects and terrain of the District, the meteorological and climatic conditions that prevail in the area, pollutant measurements which have been made, and a survey of the total emissions. An initial study surveyed air pollution control regulations adopted in other areas and included discussions with eminent professional people in the air pollution field. Concepts and principles were discussed in many meetings with interested industry groups, and the first draft of Regulation 2 was made. A condensed version of Regulation 2 is presented, covering the five classes of source operations, general limitations, and some of the features not found in other regulations. Sampling methods are included as part of the regulation. Sections of particular interest to foundry operators are reviewed. A literature review of the main emission source operations in foundry practice is presented, giving a chemical and physical description of these emissions and ways to estimate the emissions. Controls being installed to meet the emission limits are shown, including a breakdown of foundry source operations with a description of the control method or methods being used or installed. Some of the problems which have been encountered are mentioned. The control of organic vapors from core ovens and similar operations is part of future trends. An increased coverage of foundry floor operations, a discussion on expected technical advances in operating practices and control methods, is presented. (Author abstract modified)

SOCIAL ASPECTS

1974

48588 **APTIC NO. 70161**

Brattain, R. Robert

MYTHS AND FACTS ABOUT ENVIRONMENTAL CONTROL. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 281-294. 12 refs. (Sept. 25-27.)*

Myths and facts about environmental control are discussed. Two facts having important consequences with the public must realize for environmental control to be effective are: the worldwide and interconnecting nature of the environmental system and the impossibility of changing just one element of the system. Myths commonly held concerning the ecology of the planet include: the belief that mandating a standard or regulation will solve the problem, the belief that environmental degradation is connected with the capitalistic social system, the view that technological progress cannot be halted even at the expense of environmental deterioration, and the belief that there is a technical solution to the environmental question. Limitation of the number of people using energy is cited as the only solution to the environmental problem.

48589 **APTIC NO. 66596**

Honda, Chuji, Takayoshi Muto, and Shuhei Goda

EVALUATION OF AIR POLLUTION BY FACIAL EXPRESSIONS. *(Taiki osen jokyo no kao ni yoru hyogen). Text in Japanese. Preprint, Japan Society for Instrument and Control Engineers, p. 295-296, 1974. 2 refs. (Presented at the Japan Society for Instrument and Control Engineers, Lecture Meeting, 13th Yohohama, Japan, Aug. 27-29, 1974.)*

Air pollution due to moving sources in the 23 wards of Tokyo was evaluated by the discrete faces method, which devides faces into contour, eye, nose, mouth, ear and eyebrow, corresponding to sulfur oxides, nitrogen oxides, particulates, carbon monoxide, hydrocarbon and aldehyde. Each category was classified into five patterns indicating the degree of pollution. Eight classes of face were obtained from computation using data obtained in the 23 wards. Chiyoda-ward and Minato-ward, where pollution was most serious, were listed as class A with an awful looking face, and Edogawa-ward as class H with a happy looking face.

48590 **APTIC NO. 70085**

Price, Melba and Bailus Walker, Jr.

PUBLIC BEHAVIOR DURING AN AIR POLLUTION EPISODE: IMPLICATIONS FOR HEALTH PLANNING. *Med. District Columbia, 43(12):603-608, Dec. 1974. 8 refs.*

A simple survey was conducted in the District of Columbia to ascertain public behavior during an air pollution episode which occurred in the Washington metropolitan area in July 1973. The effects of the air pollution episode on health, the episode stages, the methods of the survey, and the results of the survey are discussed. The survey indicated a reluctance on the part of metropolitan residents to change their behavior pattern (mode of transportation) during the air pollution alert. It was also apparent that existing methods of obtaining public support during an alert were insufficient to induce changes in habits, attitudes, and behavior with regard to those factors which contribute to levels of pollution. The mere announcement on radio and in the newspaper of an air pollution episode was insufficient to motivate changes.

48591 **APTIC NO. 69210**

Kyoto Municipal Government, Japan

THE STATE OF COMPLAINTS AGAINST POLLUTION AND THE OPINIONS OF CITIZENS. *(Kogai ni taisuru kujo no jittai to shimin no iken). Text in Japanese. In: Kyoto-shi Kogai Ekigaku Kenkyu Hokoku (1966-1972), p. 52-64, March 1974.*

Following the 1972 epidemiological investigation of chronic bronchitis on 6054 households in Kyoto, a questionnaire was given to the same people for their opinions and desires as citizens concerning pollution control programs for the city. Answers from 4053 to 4878 persons (the number varied by the question) were tabulated. The five major complaints were traffic noises, traffic vibrations, water pollution, bad odors from pig or chicken farms and fishmeal and fertilizer factories, and factory and plant noises. Most compaints were against automobiles and other vehicles. Among the sources of bad odors, the number of complaints against pig and chicken farms and fishmeal or fertilizer factories were two or three times as great as those against chemical and pharmaceutical factories. After these five major compaints came complaints against other types of pollution. The correlations between the number of complaints registered in this questionnaire and the degree of sulfur oxide and nitrogen oxide were obtained by the Pearson coefficient calculation. Correlation between air pollution complaints and SOx pollution was 0.64, and that between traffic complaints and NOx pollution was 0.60. But the complaints registered through the usual channel of the municipal government office of complaints show an extremely low correlation coefficient of 0.19 with pollutants. This indicates the inaccuracy of judging the state of pollution by the amount of officially channeled complaints.

48592 **APTIC NO. 69253**

Tokyo Metropolitan Government, Citizens Bureau (Japan)

THE 1974 TOKYO METROPOLITAN GOVERNMENT ADMINISTRATIVE QUESTIONNAIRE, NO. 1 ON PHOTOCHEMICAL SMOG CONTROL MEASURES (DATA ANALYSIS). *(Showa-49nendo dai-1-kai, tosei monita anketo, kokagaku sumoggu taisaku ni tsuite, shukei kekka). Text in Japanese. 43p., July 1974.*

A questionnaire on photochemical smogs was sent to 493 residents of the greater Tokyo area including some rural areas, on May 20, 1974. The return rate on May 30 was 96%. The degree of awareness and attention to smog forecasting and warnings was 76%; 52% of women and 39% of men though the citizens were aware of photochemical warnings. As to the method of communication for warnings and alerts, 152 suggested the bulletin boards and circulars of public organizations; 70 suggested the use of PA systems from monitoring cars; 60 suggested chimes, sirens, and flags in heavily populated areas, and 45 suggested the use of television, newspapers and other mass communication media. With regard to automobile exhaust gas control, 51% of the responses felt the request for volunteer reduction of driving was useless and ineffective; as a solution for improvements, 98 suggested more strict enforcement of regulations, 58 suggested a drastic tax increase for automobiles and gasoline; 56 suggested improvements and expansion of public transportation systems, and 33 suggested removal of parking areas in the city; 48% of the responses felt the enforcement of closing roads for traffic was effective and good; 72% felt further increases in the number of automobiles in Tokyo would be dangerous. For methods of controlling the number of cars, prohibition of cars without garages, control of traffic law violating cars, limitation of the number of cars entering the city, increases of taxes, and the legal control of the number of automobiles manufactured were some of the suggestions.

1973

48593 **APTIC NO. 69940**

Environmental Protection Service, Ottawa (Ontario), Mobile Sources Div.

CANADIAN AUTOMOBILE DRIVER SURVEY (FINAL REPORT). *Rept. EPS 3-AP-73-10, 117p., Oct. 1973.*

Results from random questionnaire sampling of households in four Canadian cities (Vancouver, Edmonton, Toronto, and Montreal) regarding Canadian driving characteristics are presented as part of a study of the existing impact of Canadian exhaust emission regulations and possible future control strategies. The main categories of the questionnaire included: characteristics of the household, characteristics of the principal driver, characteristics of the principal passenger vehicle, and the opinion of drivers on installation of automobile emission control devices. The number of households reporting at least one car ranged from 85-90.8%, with 30% of the families having one licensed driver and 50% having two licensed drivers. Use of the car for driving to work was reported among 69.7-77.8% of the respondents, with 68.9-93.6% of the commuters requiring less than 30 min for total work travel each day. Full-sized vehicles accounted for 39.7-52.2% of all vehicles, with 8-cylinder engines being more popular than 4- or 6-cylinder engines. Only 0.7-2.8% of the drivers used lead-free gas. Approximately 40% of the driving population traveled between 7501 and 12,500 mi/yr. Approximately 40% of all drivers had major tune-ups at intervals of 3001-6000 mi. and another 40% every 6001-12,000 mi. Approximately 70% of all drivers indicated that they were prepared to pay more to decrease pollution, with 40% willing to pay up to $100. Most of the drivers believed that government intervention through restrictive legislation or subsidy was the best way of achieving improved air quality.

1972

48594 **APTIC NO. 69302**

Tokyo Metropolitan Government, Citizens Bureau (Japan)

PUBLIC OPINION SURVEY ON MAN AND VEHICLES: PHOTOCHEMICAL SMOGS AND RESTRICTION MEASURES ON VEHICLES. *(Hito to kuruma ni kansuru seron chosa - kokagaku sumoggu to kuruma kisei ni tsuite). Text in Japanese. 33p., July 1972.*

The awareness of citizens of Tokyo concerning photochemical smogs and the effects of automobiles was investigaged by questionnaires distributed among 3000 residents above 18 yr of age randomly selected from greater Tokyo (exclusive of the islands) between July 1 and 12, 1972. The response rate was 72.7%. To the question concerning the word association for automobiles, 35% answered accidents, 16% answered pollution and smog, and 15% answered exhaust gases. In other words, 75.5% of the total response was detrimental. Close to 100% of the respondents knew about the various episodes of asthmatic attacks, lead pollution, and photochemical smog damages that had occurred in Tokyo, and 90% of them knew that automobile exhausts were the main cause of photochemical smogs. Close to 10% received some physical effects from photochemical smogs, and 23.3% answered that they knew someone who received physical damages; 58% of those who never received photochemical smog damages and 87% of those who had some experience with them feared future incidents. With regard to smog warnings, 60% of the respondents did not know about the warnings; 20% answered that they knew immediately, and 17% sometimes knew; a higher rate of car users knew about it. As to their own personal reaction to warnings, 34.3% answered that they closed windows and refrained from going out; 18.8% washed their eyes or gargled; 1.6% refrained from driving cars; but 49.8% did not do anything. Whether they use automobiles for work or pleasure, more than 50% think traffic control would be a good idea.

GENERAL

1975

48595 **APTIC NO. 70257**

Shoji, H.

REVIEW OF THE STUDY ON AIR POLLUTION OF KINKI DISTRICT IN JAPAN. *(Kinki ni okeru taikiosen kenkyu no kaiko). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(1):55-60, Jan. 1975. 24 refs.*

The history of Japanese air pollution was reviewed from 1868-1914, 1914-1940, and 1940-1970. The influence of capitalism on the Japanese economy and the development of Japan s heavy chemical industry are also discussed in connection with trends in Japanese air pollution. The value of past research must be carefully substantiated in order to effectively utilize results for future studies. Japanese and international environmental problems are discussed in terms of socio-economic factors, human health, and natural resources.

1974

48596 **APTIC NO. 67138**

Belgea, Frank J.

DERIVATION, APPLICATION AND INTERRELATIONSHIP OF AMBIENT NOISE MEASUREMENT PARAMETERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-65.)*

A study was undertaken to determine the rationale and justification for the profusion of schemes proposed from the purpose of quantifying nonimpulsive ambient noise levels. The study explored the multiplicity of noise measurement parameters involved in significant control strategies. Highlights of the study and derivations for typical parameters, weighted and unweighted and objective and subjective, are presented. The application of significant noise measurement techniques is explained in enough detail to impart understanding of complex methodology. Many of the noise control schemes are interrelated. Such techniques as time and frequency weighting are employed to derive new parameters from existing ones. Approximate conversion factors are presented for conversion between compatible systems. Uniform noise control legislation is necessary. To be most effective, noise control parameters should be expressed in terms to which the public can relate and which do not require an expensive black box to measure. (Author abstract modified)

48597 **APTIC NO. 69692**

Gilbert, T.

A SIMPLIFIED METHOD FOR CALCULATION OF THE MINIMUM STACK HEIGHT AT EMISSIONS OF GASEOUS FLUORINE COMPOUNDS FROM BRICK KILNS. *(Ein verenifachtes Verfahren zur Berechnung der Schornsteinmindesthoehen bei der Emission von gasfoermigen Fluovoverbindungen aus Ziegeleien). Text in German. Gesundh.-Ing., 95(9):257-258, 1974. 7 refs. (Presented at the Second Symposium on Branch-specific Emissions, Fluorine Emissions by Brick Kilns, Munich, Germany, Feb. 1, 1974.)*

A new pragmatic procedure for the calculation of stack height for brick kilns uses, aside from the guideline VDI (Jerein Deutsche Ingenieur) 2289 and No. 2.6 of the Technical Directives for Clean Air Conservation (TALuft), the following conditions. The emission conditions are evaluated in the vicinity of the source only under the unfavorable condition of the rarely occurring labile stability class V by Klug. In a first coarse approximation it is then assumed that the emission conditions under other stability conditions are better. For the wind velocity, the average velocity in the waste gas plume of 3 m/sec is used. For the emitted concentration of fluorine compounds, the 60% value of the recommended maximum allowabe short-term emission concentration of 5 micrograms F/cu m, i.e. 3 micrograms F/cu m, is inserted into gas plume incrementation the method of Briggs was used. The point of the theoretically anticipated emission was used for the calculation. A numerical example is presented.

48598 **APTIC NO. 69186**

Iwasaki, Iwaji

ENVIRONMENTAL POLLUTION IN GEOCHEMISTRY. *(Chikyu-kagakuteki ni mita kankyo osen). Text in Japanese. Kogyo Yosui (Ind. Water), 193(10):8-22, Oct. 1974.*

Environmental evolution is described from prehistory to the present to investigate how environmental pollution was caused. Environmental pollution is generally discussed from the standpoint of geoscience. Environmental pollution is a

natural occurrence as mankind grows and evolves. Nature can offset some environmental pollution, but any excess pollution, dangerous to humans, must be controlled and regulated by government. Environmental policy must be based on human health, rather than Technological or economic progress.

48599 **APTIC NO. 65212**

Keast, David N.

SOME PITFALLS OF COMMUNITY NOISE MEASUREMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 15 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-63.)*

Data is presented indicating that the common use of brief noise samples of 1-hour duration or less to characterize the outdoor sound environment of a community can be grossly misleading, particularly in suburban and rural areas. There are growing indications that sound surveys of 1 to several days in duration are not really adequate for this purpose. There is a need for better understanding of longer-term weather and seasonal variations of community sound environments, for long-term community noise monitoring studies at selected locations, and for suitable instrumentation for this purpose.

48600 **APTIC NO. 65521**

Leutheusser, Hans J. and Jiri Motycka

REDESIGN OF REFINERY STACKS BY WIND TUNNEL TESTS TO MEET CHANGES IN CRUDE OIL QUALITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-163.)*

A typical wind tunnel study is described in which physical modeling of stack plumes was used to determine if a relatively small allowable increase in stack height would be sufficient to maintain existing air quality. Effluent emissions from a waterfront refinery currently satisfy official air quality standards. A pending change in crude oil quality may lead to a violation of the standards even though no increase in refinery capacity is contemplated. The various relationships between ground intercept and wind speed indicate that, for fixed conditions of stack height and flue gas exit velocity, ground intercept increases strongly with decreasing wind speed. The variation of ground intercept with velocity ratio for three different stack heights suggest that the proposed construction of a single 250 ft-high utilities stack in lieu of an existing group of three 150 ft utilities stacks, represents a viable solution to the problem of neutralizing an expected adverse change in crude oil quality. The model and various experimental techniques used in the the investigation are described.

48601 **APTIC NO. 69261**

Miyanaga, Masao

ENVIRONMENTAL ENGINEERING AND SOCIAL SCIENCES. *(Kankyo kogaku to shakai kagaku). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(9):51-55, Sept. 1974.*

A general discussion is given on the relationships between environmental science and other social sciences. A relationship between pollution science and every individual social science is required in approaching the pollution problem. Before it is approached, the effectiveness and limit of every individual social science must be clarified. Among the social sciences, economy has the most intimate relationship with pollution. Material balance analysis - quantitative and qualitative analysis of the material input and output in the entire environment - requires data from all economic units. The future of the environmental condition can be predicted from the trend of the past and present activities. To control the future environmental condition, economists are expected to contribute to the success by providing their knowledges.

48602 **APTIC NO. 69975**

Murphy, J. R. and L. D. Broemeling

STATISTICAL CONCEPTS FOR DESIGN ENGINEERS (FINAL REPORT). *Oklahoma State Univ., Stillwater, Environmental Protection Agency Grant R-802269, Program Element 1AB013, Rept. EPA-650/2-74-080, ROAP 21ADE-026, 151p., Sept. 1974. 35 refs.*

Basic statistical concepts for design engineers are summarized and are related to the planning, analysis, and interpretation of scientific experimentation. Sufficient background is provided so that project engineers will have the ability to know what statistics can and cannot do; recognize potential areas for the application of statistical methods; aid in the direction and thrust of statistical analysis of data; share a greater role in the interpretation of results and the formulation of conclusions and recommendations; and make efficient use of whatever statistical consulting expertise is available to them. Topics covered include: populations, variability, uncertainty, and sampling; variability and random error; basic concepts of probability and mathematical statistics; sampling and inference; and experimental test programs.

48603 **APTIC NO. 65214**

Roth, Mark C., Conan P. Furber, and Nurtan A. Esmen

THE EFFECTIVENESS OF HIGHWAY SOUND ABATEMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1974. 14 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-66.)*

Through the use of case studies, highway noise abatement methods of elevated and depressed highway sections, earth berms, wall type barriers, and plantings for their cost-effectiveness in reducing noise levels is presented. Although the methodologies used in the case studies differed somewhat, a common base was used to determine a range of noise level reduction for each type of shield. The estimated cost associated with each type of shield was determined and included in the rating system. Aesthetics was considered as a benefit, but lack of it was considered as an added cost. Aesthetics was considered from both a community point of view and passenger point of view and the methods of noise abatement ranked based on a personal survey. The cost ranking was plotted against expected noise reduction for each method to determine the cost effectiveness of each. The methods of depressed highway configuration, earth berm, intervening structures, and kinematic wall were the most cost-effective methods, and plantings were the worst. These results are intended to serve as an aid in the decision-making process and are by no means absolute. A need for standardization in noise measurement and evaluation is cited.

48604 **APTIC NO. 70254**

Takamatsu, T.

ENVIRONMENTAL CONTAMINATION CONTROL (III). *(Kankyo osen seigyo (III)). Text in Japanese. Keisoku to Seigyo (Meas. Control), 13(11):18-23, Nov. 1974.*

Studies on air and water pollution are reviewed. The development of measurement apparatus, modeling of physical and chemical changes of contaminants, development of physical models, combination of physical and non-physical models, development of non-physical models, and development of control methods are described. Measurement methods must be simple to operate, and analytically accurate. Data analysis, detection of original source, and estimation of pollution concentration are discussed. An estimated calculation model, a development of control method and a study on the environmental system of a body of water are included.

48605 **APTIC NO. 65213**

Tempelmeyer, K. E.

A RATIONAL TECHNICAL BASIS FOR COMMUNITY NOISE CONTROL. *Preprint, Air Pollution Control*

Assoc., Pittsburgh, Pa., 25p., 1974. 14 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-64.)

The approach of compiling and utilizing statistical noise data is outlined to offset the legislatively-chosen noise emission levels which have been either too high or too low. Anti-noise legislation needs to provide a solution for existing operational noise problems, long range reduction of the noise potential levels of various products and devices, and prevention of the perpetuation of many existing noise pollution problems through better land-use practices in the future. The use of statistical measurements provides information concerning how many sources will be impacted by the proposed legislation, how large the enforcement problem will be, and what portion of complaints would be eliminated by establishing any particular limit.

48606 **APTIC NO. 69321**

Thring, M. W.

AIR POLLUTION--A GENERAL SURVEY. *Int. J. Environ. Stud., vol. 5:251-257, 1974. 9 refs.*

Harmful emissions from vehicles include carbon monoxide, unburnt and partially burnt hydrocarbons, soot, lead compounds, and nitrogen oxides. Carbon monoxide can build up in streets or tunnels. If the exhaust discharge were placed at the top of the car, air circulation would disperse it much more rapidly. In an inversion lasting 1 wk or so, the oxides of nitrogen can build up to a dangerous level over a whole region. On a global scale, CO is gradually converted to carbon dioxide, but nevertheless, a considerably greater concentration of CO can be detected throughout the Northern Hemisphere (where there are more cars) than the Southern. There is strong evidence of a dangerous accumulation of lead throughout the Northern Hemisphere. Polluted air in town causes increased death and sickness rates among adults and children compared with cleaner air in the country, but it is not yet possible to say which is the most harmful pollutant. Ways of improving the problem include afterburners, the use of a fuel which burns more easily and does not require lead additions, modifications to the conventional piston engine and its replacement by the constant speed hybrid engine, the all electric vehicle, or continuous combustion systems (gas turbine, steam engine, or Stirling engine). Pollutants are also emitted by power stations and industrial emission sources. (Author abstract modified)

48607 **APTIC NO. 65159**

(Assoc. for Economic Planning) (Japan)

GRAPHIC WHITE PAPER ON THE ENVIRONMENT. *(Zu de miru kankyo hakusho). Text in Japanese. Japan Environmental Agency, Bureau of Planning and Redevelopment, 125p., May 1974.*

The topics of discussion include: the trend of nationwide environmental pollution, appearance of new environmental problems, a trend in environmental protection policy, and the state of recent environmental pollution and protection measures. The major pollutant concentrations for Japan as a whole have changed as follows over the last several years: the level of suspended particulates decreased from about 0.3 mg/cu m in 1967 to much less than 0.1 mg/cu m; the carbon monoxide level dropped from close to 5 ppm in 1968 to about 2 ppm in 1972; sulfur oxides decreased from about 0.06 ppm in 1966 to about 0.03 ppm; nitrogen oxides, which have come to the public attention more recently, have increased from about 0.02 ppm in 1968 to 0.028 ppm in 1972. The level of hydrocarbons, also has increased, fluctuating over the years between 0.7 ppm and 0.9 ppm to close to 1 ppm in 1972. The emission and environmental standards for nitrogen oxides for automotive emissions and fixed emission sources were established in April and August 1973, and much improvement is hoped for. The cases of photochemical smogs in 1973 increased not only in number, but also in scale. In addition to the previously affected Tokyo and Osaka, cities in Okayama, Shizuoka, and Ehime were affected involving large areas and large numbers of people. The total number of reports of some physcial damages increased to 32,000 in 1973, 1.8 times more than that in 1970.

1973

48608 **APTIC NO. 69515**

Ensenat de Villalonga, Alfonso

THE PROBLEM OF AIR POLLUTION. *(La problematica de la contaminacion atmosferica). Text in Spanish. Agua (Barcelona), no. 78:46-55, May-June 1973.*

General problems of air pollution and pollution abatement in Spain are outlined. Automobiles, domestic heating, waste incinerators, and industries are the chief sources of air pollutant emissions; the latter source has a minor impact in Spain, a country with low level of industrialization. Power plants and cement works are chiefly responsible for dust emissions, while the former and metallurgical plants account for most of the sulfur dioxide emissions. The Clean Air Act of Dec. 1972, envisaging an equilibrium between ecological requirements and economical and social needs and the technological possibilities, calls for the adoption of the best practicable means for air pollution abatement against the background of economic growth. The major air pollution sources will be inventorized, maximum allowable pollutant concentrations will be established, and the activities and the establishment of industries susceptible of generating air pollution will be regulated. Rules concerning the required stack height and the type and installation of firing equipment will be elaborated.

48609 **APTIC NO. 69183**

Grzybowski, Karol

AIR POLLUTION IN POLAND. *(Zanieczyszczenie powietrza atmosferycznego w Polsce). Text in Polish. Pol. Arch. Med. Wewn., 50(9):909-915, 1973.*

Problems posed by air pollution in Poland and prevention measures are presented. The 3 main sources of air pollution in Poland are industry; municipal and residential consumers, and train and automobile transportation. In 1971, the quantity of dust and gaseous emissions to the atmosphere was estimated at 4,500,000 and 3,000,000 tons respectively. Power stations, steelworks, cement plants, and the chemical industry were the major polluters. Only 822 plants emitted 65% of the dusts and 61% of the gaseous pollutants. They were located in the Katowice, Cracow, Wroclaw, and Opole. The government has ruled that the allowed dust fall especially in protected areas should not exceed 40 tons/sq km/yr; and it should not exceed 250 tons/sq km/yr in areas under protection. The maximum permissible daytime concentration for dusts in the atmospheric air in Poland is 0.2 mg/cu m, and the 20 min concentration limit is 0.6 mg/cu m. Studies conducted in 1966 to 1967 showed values ranging from 0.121 mg/cu m in Gdansk to 0.336 mg/cu m in Zabrze. Mortality caused by pulmonary cancer and bronchitis in Katowice, Zabrze, and Gdansk was caused mainly by aromatic hydrocarbons. Only Katowice showed lead concentrations higher than 1 microgram/cu m. Contact and aspiration methods for establishing sulfur dioxide concentrations are used. The areas with highest air pollution are characterized by few sunny days, less exposure to sun, and more numerous days with precipitations and fog. The preventive measures taken lead to partial improvement. Some of the measures initiated are: planned area management, accompanied by improved sanitation in cities and creation of protection zones in the vicinity of plants; modernization of power stations; gasification of settlements; electrification and modernization of train transportation; and modernization of industry based on the protection of the atmosphere.

1972

48610 **APTIC NO. 66752**

Blakeslee, H. William and Louis R. Reckner

AIR POLLUTANTS. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 4, p. 228-247. 15 refs.*

Carbon dioxide, carbon monoxide, sulfur compounds, photochemical oxidants, and particulates are reviewed in terms of their physical and chemical properties, physiological and pathological effects, and their natural or manmade sources. Carbon dioxide increases resulting from the use of fossil fuels are responsible for the greenhouse effect, whereby the average temperature of the earth s atmosphere increases. The effect is opposed, however, by atmospheric smoke and dust, and concern over CO2 pollution may be needless, considering its value to plant life. Carbon monoxide is the most ubiquitous pollutant gas in the world and results primarily from incomplete combustion of carbonaceous fuels. The molecule is capable of combining with blood hemoglobin in humans and blocking oxygen transport. Among sulfur oxides polluting the environment, sulfur dioxide is the primary industrial pollutant, with power utilities being responsible for over 50% of the SO2 emissions. Aside from its plant-damaging capability, the molecule is capable of causing lung damage in humans when environmental conditions are favorable for sulfuric acid conversion. Photochemical smog resulting from the action of sunlight on the hydrocarbon and nitrogen oxide components of vehicle exhausts is irritating to the eyes and respiratory tract and can cause increased incidence of infection and disease. Ozone and peroxyacyl nitrates are secondary pollutants in the photochemical reactions. The optical and toxicological properties of particulate pollution are size-dependent. Possible sources are sea spray, dust storms, volcanoes, forest fires, automobile exhaust, photooxidation reactions, vegetation vapors, and industrial effluents. The toxicity of such particles also depends on their particular chemical composition.

1971

48611 **APTIC NO. 69536**

Bolin, Bert, Lennart Granat, Lars Ingelstam, Margareta Johannesson, Einar Mattsson, Svante Oden, Henning Rodhe, and Carl Olof Tamm

AIR POLLUTION ACROSS NATIONAL BOUNDARIES: THE IMPACT ON THE ENVIRONMENT OF SULFUR IN AIR AND PRECIPITATION: SWEDEN S CASE STUDY FOR THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT. *United Nations, New York, United Nations Conf. Hum. Environ., Stockholm, Sweden, 1971, 96p. 46 refs.*

Environmental damage from sulfur dioxide and sulfuric acid in Sweden was quantitatively assessed and control techniques and their costs are discussed. The direct effects fo atmospheric SO2 are confined to areas surrounding the emission source, but the SO2 is transported more than 1000 km before it is deposited on the ground. The harmful effects caused by the H2SO4 deposition may be felt far from the source. Damage to vegetation occurs in urban areas where the SO2 concentration exceeds 0.01 to 0.02 ppm during extended periods of time and 0.04 to 0.05 ppm for periods of a few days. Outside urban areas such direct damage is negliglible. There is no strong evidence to show that an increased mortality occurs in Sweden due to SO2 or H2SO4. Knowledge of the effect of long exposures at low concentrations is limited. Metallic and painted surfaces are affected. A cost curve was derived showing what control techniques should be introduced to reduce the sulfur emissions by different degrees at minimum cost. Cost data are not accurate enough to permit quantitative long range conclusions.

48612 **APTIC NO. 69432**

Englund, Harold M.

THE LITERATURE OF AIR POLLUTION. *In: Air Pollution Control. Part II. Werner Strauss (ed.), New York, Wiley-Interscience, 1971 (?), p. 255-289. 94 refs.*

A list of technical information resources, books, manuals, proceedings, bibliographies, and periodical literature is presented which provide information on air pollution. Abstracts of literature on general aspects, sources and the nature of air pollution, transport of air pollution, sampling and analysis, economic effects, health effects, and control of air pollution are given.

48613 **APTIC NO. 67053**

McCormac, Billy M. and Robert Varney

INTRODUCTION. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 1-7. 2 refs.*

A general introduction to the history and development of air pollution is presented. Air pollution is not a recent problem, there are a number of natural forms of air pollution that existed before man and are still very significant contributors to the condition of the air environment. These are allergens, dust, volcanic gases and particles, and smoke. Mans first contributions to air pollution were probably smoke from camp fires, dust from cultivation, and noxious odors. Some of the more toxic pollutants are controlled by laws or have found use as by-products.

48614 **APTIC NO. 69327**

Stratmann, H. and B. Roeper

GOALS IN AIR POLLUTION ABATEMENT. *(Zielsetzung im Bereich des Immissionsschutzes). Text in German. Minister fuer Wissenschaft und Forschung (Germany), Arbeitsgemeinschaft fuer Rationalisierung des Landes Nordhein-Westfalen, Sitz. Arbeitsgruppe Ration. Gesetzg., 1971, p. 1-57. (Dec. 10-13.)*

The general technical and legislative aspects of clean air maintenance are discussed. The pollutant load capacity of the atmosphere before the appearance of primary symptoms of damage is very limited, and not even the lowest pollutant concentrations can be considered harmless. The hygienic assessment of air pollution is greatly complicated by the synergism and antagonism of various pollutants present in the air simultaneously. The maximum allowable pollutant concentration is set at an acceptable risk as it would be unrealistic to demand complete absence of any harmful effect. Preventive and corrective measures to be taken for clean air maintenance should be determined as a function of the state of the art of the clean air maintenance techniques available. Singular preventive measures relative to individual emission sources are not adequate in cases when the load capacity of the atmosphere in the specific area is already exhausted. Therefore, collective preventive measures are necessary for groups and types of sources, e.g., equipment constituting emission sources, fuels, and the design of equipment and motor vehicles.

1968

48615 **APTIC NO. 70057**

Mironov, O. G.

DEVELOPMENT OF CERTAIN BLACK SEA FISHES IN SEA CONTAMINATED BY PETROLEUM PRODUCTS. *(Razvitiye nekotorykh chernomorskikh ryb v morskoy vode, zagryaznennoy nefteproduktami). Preprint, Ukrainian SSR Academy of Sciences, Sevastopol, Inst. of Biology of the Southern Seas, 1968 (?). 4 refs. Translated from Russian, 9p.*

A study was made of the development of the fertilized eggs of fish (Engraulis enrasicholus ponticus Alex., Scorpaena porcus L., and Crenilabrus tinca L.) in sea water containing 0.1-0.01

mg/l petroleum, solar oil, and mazut. The different species sensitivity of the fish to the petroleum products was found. The damaging effect of these compounds was clearly traced down to a concentration of 0.001 ml/l. Lower concentrations of petroleum, solar oil, and mazut also were toxic for the hydrobionts. The development of the fertilized roe in different concentrations of petroleum and petroleum products is described, and experimental results are presented.

1966

48616 **APTIC NO. 70059**

Chalfina, N. A.

SPECIES OF GENUS MELOSIRA AG. OF AMUR RIVER PLANKTON. *(O vidakh roda Melosira ag. planktona reki Amur). In: Novosti Sistematiki Nizshikh Rasteniy. Moscow, Nauka Publishing House, 1966, p. 43-46. 10 refs. Translated from Russian, 6p.*

Samples of Amur plankton were collected, and their types, sizes, forms, and characteristics were determined. The results of plankton and spore measurements in other rivers and lakes are also mentioned.

48617 **APTIC NO. 70058**

Skabichevskiy, A. P.

SYSTEMATIC POSITION OF MELOSIRA AMBIGUA (GRUN.) O. MULL. AND ITS NEW FORM. *(O. sistematicheskom polozhenii Melosira ambigua (Grun.) O. Mull. i yeye novoy formy). In: Novosti Sistematiki Nizshikh Rasteniy. Moscow, Nauka Publishing House, 1966, p. 46-51. 9 refs. Translated from Russian, 9p.*

The systematic position of the diatom alga Melosira ambigua has not received universal acceptance. Several authors consider it a form subordinate to M. italica. Others believe it is a distinct species. Observations were made of M. ambigua in plankton in rivers and several lakes to determine its position. Among the vast majority of M. ambigua cells with the typical, more or less deep annular groove, cells were encountered in which the groove did have an acute-angled form resembling that of M. italica. Further study showed that these italica-shaped cells were juvenile. The significance of the shape of the annular groove was examined as a distinguishing feature of M. ambigua. The variability of the M. italica and M. ambigua forms were studied in a reservoir and a lake. M. ambigua is therefore independent of M. italica. The features of F. altaica were also compared to those of M. ambigua.

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